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Winning Number
in
ELECTRICAL WEST'S
Kilowatt-Hour Derby
120,612,845,000

For Winner, See P 124

ELECTRICAL WEST

April 1958
50 Cents

SPOKESMAN FOR THE MOST HIGHLY ELECTRIFIED REGION OF THE U. S.

Automatic Warehouse 80

Catalyst for Industry . . . 71

When and Where to Use Grounding Transformers 88

How to Delegate Authority 99

News 114

Look for this "Medallion Home" Award

—it tells you that the home you're about to buy is truly modern

Astonishingly enough, two out of three homes being built today do not provide the modern electric appliances people want most. Worse than that, in most cases no wiring provision is made for their eventual installation. These "new homes" are electrically obsolete the day you buy them.

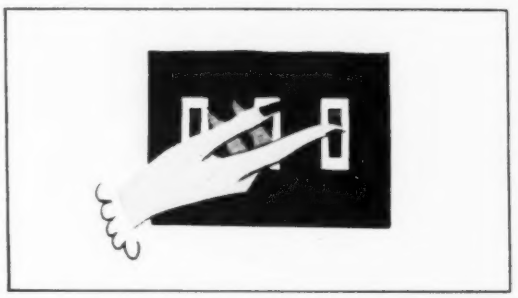
Yet it costs so very little to enjoy the enormous convenience these labor saving appliances bring you—especially when they're provided for when the house is still in the planning stage.

Now—a new service has been inaugurated that tells you whether the home you're about to buy is truly modern. Electric utility experts work with leading builders when their homes are still in the planning stage—to let you enjoy modern electric living *the day you move in*. Then, and only then, are these homes awarded the nationally famous "Medallion Home" Award.

Here are the "extra" features in every "Medallion Home"—

1. Your most-needed electric appliances will be already installed!

"Medallion Homes" come equipped with an ultra-modern electric range *built-in*—as well as at least three other major appliances. What's more, wiring for future needs is in and paid for.



2. The home is properly wired for "Full Housepower"

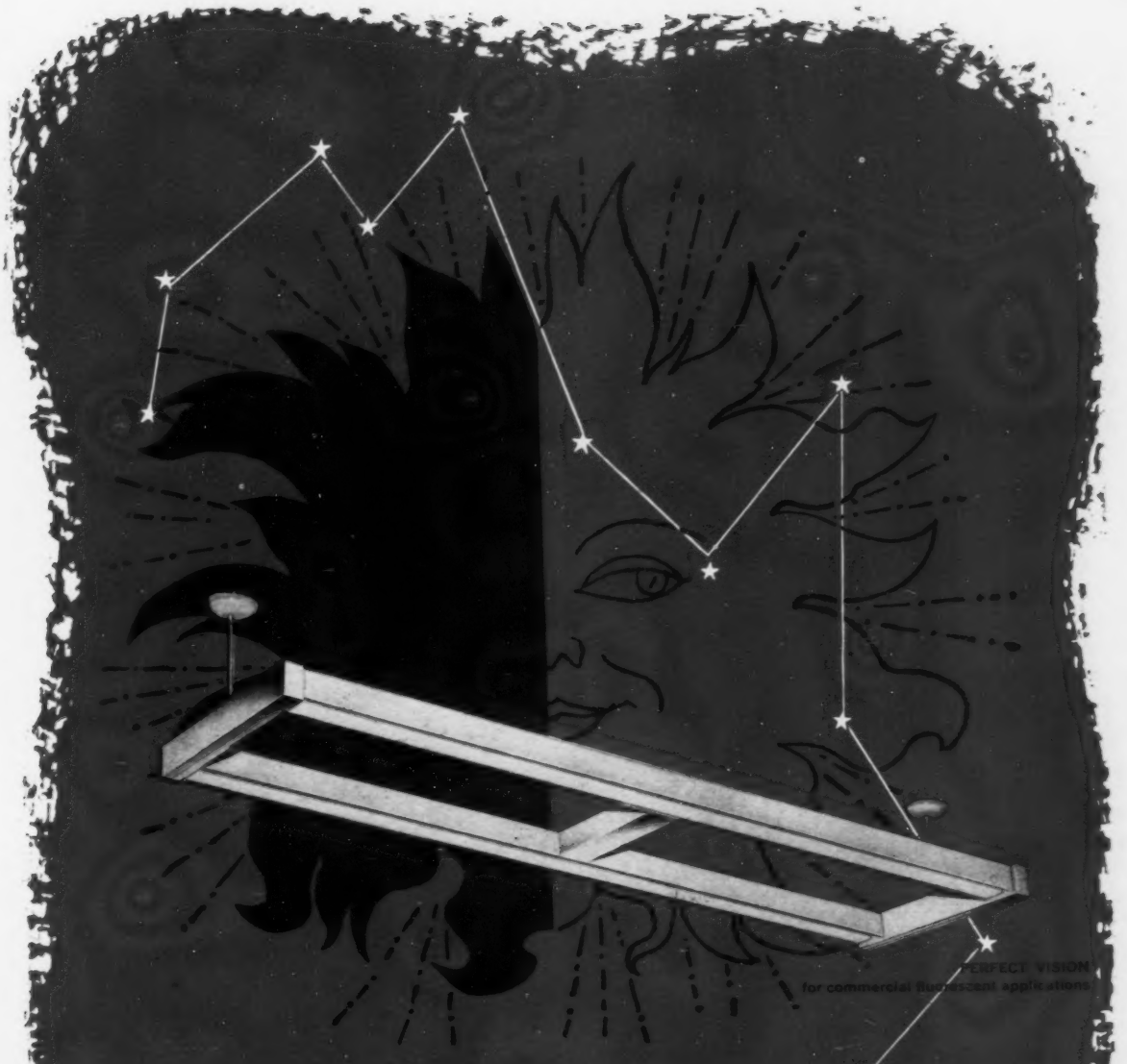
It has plenty of outlets and switches in *convenient* locations. It has enough separate circuits for proper and efficient power distribution—and provision for extra circuits you may need later on.

3. The home has "light for living"

Every "Medallion Home" includes fixtures that both beautify *and* illuminate—and light such important areas as the kitchen sink, bathroom shower and mirror, and outside each entry to the home.

Be sure your new home has all these extras—

SOUTHERN CALIFORNIA Edison COMPANY *helps you* LIVE BETTER—ELECTRICALLY



PERFECT VISION
for commercial fluorescent applications

when you think of **lighting**

think of **SMOOT-HOLMAN**

PERFECT VISION Luminaires combine attractive styling with even light distribution and high efficiency . . . easier hanging and lamping. The design has been copied, but not the lighting performance. Insist on the genuine, original PERFECT VISION Luminaire. Be sure it carries the SMOOT-HOLMAN label!

Write for brochure with performance data

SMOOT-HOLMAN COMPANY, *Inglewood, California*

ELECTRICAL WEST

SPOKESMAN FOR THE MOST HIGHLY ELECTRIFIED REGION OF THE U.S. Established 1887

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L-M's Permaline conduit is light, easy to handle, easy to install. One man can easily carry two 10-foot lengths.

L-M's extra-long 10-foot lengths of Permaline conduit speed installation. Simply tapping the tapered coupling onto the tapered end of the conduit makes a strong, watertight joint—no caulking needed.

Saves Time and Labor...

Contractor Eliminates 13,750 Joints

With Long 10-foot Lengths of L-M Permaline Conduit!

Now, with L-M's exclusive 10-foot lengths of Permaline fibre conduit, you can eliminate 20% to 50% of the joints to be made on a job, and thus cut costly construction time and labor.

On one job requiring 550,000 feet of conduit, the contractor eliminated 13,750 joints by using L-M's long 10-foot lengths as compared with 8-foot lengths.

It will pay you to use L-M's time- and labor-saving 10-foot lengths of Permaline conduit for your next duct job. L-M Permaline is the original 10-foot-long fibre conduit.

Easy to Install

L-M lightweight Permaline fibre conduit is also easy to install. Joints are quickly made by simply tapping the tapered coupling onto the tapered end of the conduit. Joints are watertight and safe from seepage. Smooth bore reduces cable sheath abrasion. Completely engineered system for installation includes full line of bends, bell ends, couplings, and base and intermediate spacers.

L-M Permaline fibre conduit comes in 5, 8 and 10-foot lengths. Available diameters include 2, 3, 3½, 4, 4½, 5 and 6-inch sizes.

Get Complete Information

Ask the L-M Field Engineer for a copy of the 12-point plan folder which shows how easy it is to use the Permaline system; or Fibre Conduit Bulletin UG1A, which gives complete specifications. Or write Line Material Industries, Milwaukee 1, Wisconsin.

310-R

LINE MATERIAL Industries

McGRAW-EDISON COMPANY

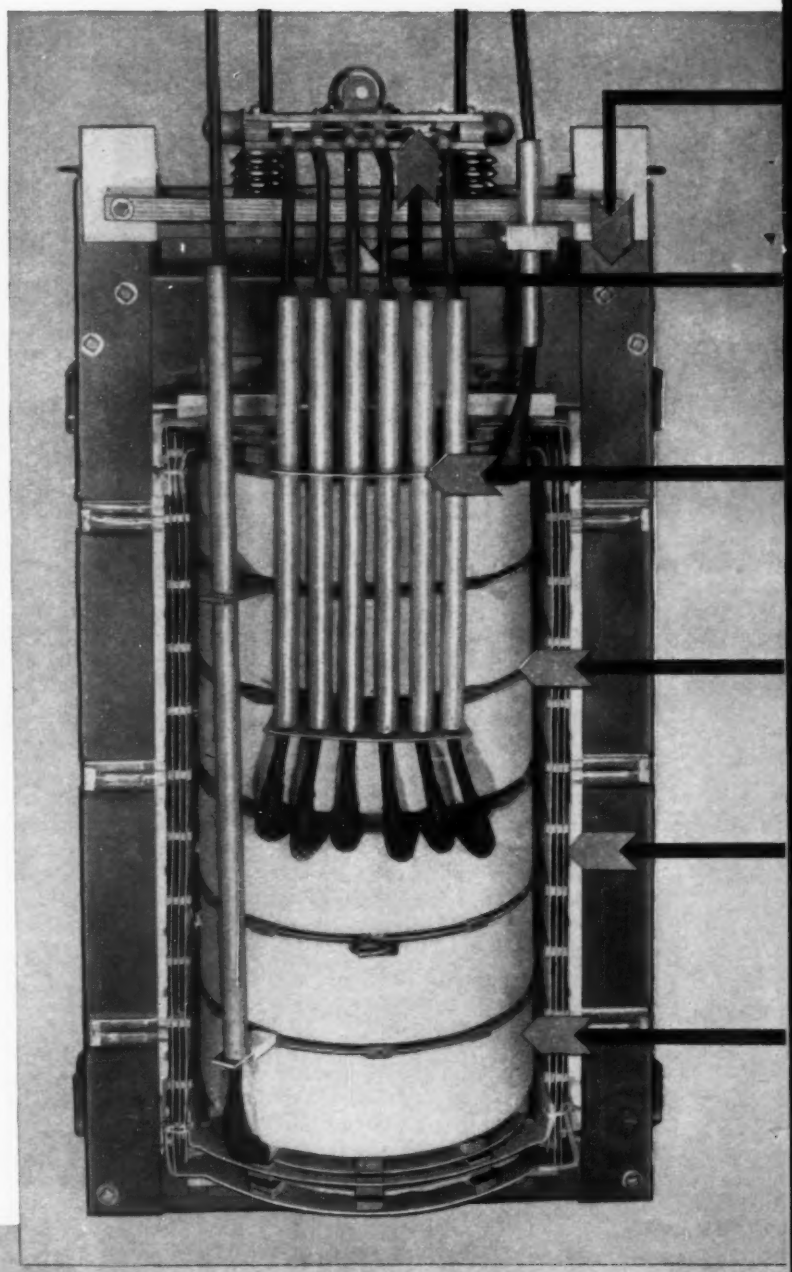
McGRAW EDISON

Permaline Fibre Conduit

BPI

This seal is your guarantee of recognized quality in Bituminous Fibre Conduit.

Internal Ruggedness...



As a general rule, the higher the voltage, the more essential it is that transformer service be continuous and trouble-free. This is true from the standpoint of economics as well as that of customer satisfaction . . . and it is why Pennsylvania gives you *extra* ruggedness where it counts the most, in high voltage Pole Stars.

Take a look at the interior design features shown on these pages and see for yourself. From the patented lap-on-top core to little noticed lead supports, Pole Stars are designed and constructed to deliver *sustained performance* in every type of transformer installation. You can rely on Pole Stars for long range economy and dependability throughout the complete range of EEI-NEMA ratings: through 500 kva, through 67,000 volts, single phase. Pennsylvania Transformer Division, McGraw-Edison Co., Canonsburg, Pa.

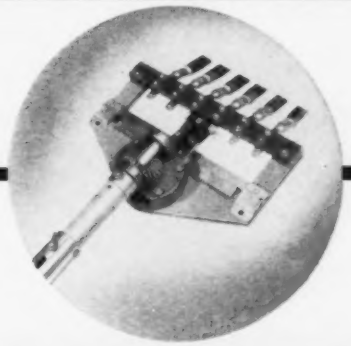
The unit pictured is 500 kva. High voltage: 67,000 volts. Low voltage: 7560/13,090Y volts. Construction features shown may vary somewhat in other voltage classes.

PENNSYLVANIA

key to sustained performance of high voltage

POLE STARS

ANGLE-AND-CHANNEL CORE FRAME



Core-and-coil assembly is supported by a sturdy, pressed steel, angle-and-channel frame, which is securely fastened together by bolts with permanently positioned nuts.

STRAIGHT-LINE TAP CHANGER

Straight-line tap changer is of same rugged design as that featured for years on Pennsylvania Power Transformers. Sintered silver-nickel contacts possess electrical qualities of silver and wearing characteristics of nickel.

INTEGRAL LEAD SUPPORTS

High voltage leads are insulated in pressboard tubing and held firmly in position by supports that are an integral part of the coil.

LAP-ON-TOP CORE

Core features Pennsylvania's patented lap-on-top construction. Laminations are individually lapped, creating a large cross-section area at lap that reduces density and prevents concentration of flux. Absence of gaps or butt joints assures low exciting current.

INSULATION AND BRACING

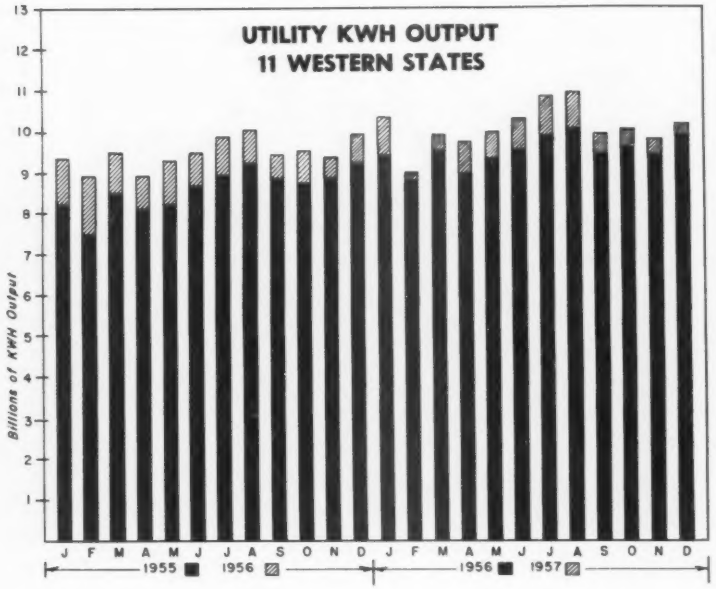
Coils are "packed out" with insulation to securely lock core and coil together. Maple braces provide extra support at top and bottom and help to protect against possible short circuit forces.

SECTIONAL COIL

High voltage windings are sectional, with low voltage layer windings inside. Use of sectional coils in higher voltages improves insulation . . . permits weight and size reductions. Also results in uniform distribution of impulse voltage and greater resistance to short circuit.

DISTRIBUTION TRANSFORMERS

----How're We Doing?



Output Comparisons

Year-to-year Kwh Output Changes in Western Regions and U. S. Per Cent Changes Over Same Week One Year Ago

Week Ending	Rocky Mountain	Pacific Southwest	Pacific Northwest	U. S. Total
Feb. 1	0.0	−1.4	−7.7	−0.7
Feb. 8	+2.1	+0.6	+1.5	+2.2
Feb. 15	+0.8	+3.7	+4.8	+3.9
Feb. 22	−1.1	+3.0	+1.3	+3.5
Mar. 1	+6.0	+2.0	+2.3	+0.1

Business Straws

Despite recession, a 5,000,000 unemployment figure and much talk about "pump-priming," heavy construction contracts moved upward in January and February—by substantial percentages . . . Spot checks of electrical suppliers in the California area indicate that business is still quite good measured by any standard . . . Oregon got off to a good start with an 11% increase in housing starts during January . . . The backlog of Western heavy construction still topped the $26 billion figure . . . Retail sales were holding up surprisingly well although admittedly less was being spent for durable goods . . . Nationally, credit repayments for January exceeded new borrowing . . . These random straws indicate there is nothing too much wrong with the basic economy.

Power Indicators

If the weekly statistics above can be believed, the week of Feb. 1 was the low point for the rate of change of power output for the year to date. That week all factors were negative as compared to a year ago except in the Rocky Mountain area which just broke even. Since that time power use in the West has been climbing. In the Pacific Northwest, which was consistently below last year's weekly output right through the week ending Feb. 1, February showed a consistent increase in output with the indexes on the plus side for every week during the month except the first. Also of interest is the fact that the number of customers in the 11 Western states as of Dec. 31 totaled 8,485,925. That's official and represents a 3.2% gain during the year.

Big Projects Planned for the West

Expansion program for University of Colorado Medical School, Denver, $17,000,000.

Pulp and paper plant near Fairfield, Calif., $30,000,000.

Copper reduction plant at Hayden, Ariz. Estimated cost: $10,000,000.

High school at Auburn, Calif., $1,170,000.

Federal office and courthouse for Sacramento, Calif., $10,000,000.

Eugene Water & Electric Board has applied for permit for Carmen-Smith hydro project on Upper McKenzie River, $18,000,000.

High school in Ontario, Calif., $2,300,000.

Pepper Drive Estates, El Cajon, Calif., will construct 110 dwellings, $1,100,000.

Fairview Homes of Santa Ana, Calif., will build 314 dwellings, $3,000,000.

Phoenix courthouse and federal office building, $8,600,000.

Presbyterian Church Synod of California home for elderly persons in Portola Valley, Calif., $2,800,000.

Shopping center in Renton, Wash., $8,000,000.

Oregon State College to spend more than $5,500,000 on a men's dormitory and new physics-chemistry buildings.

A new medical research building for the University of Oregon Medical School in Portland, Ore. Cost: $2,500,000.

High school, southeast district of Portland, $5,000,000.

Columbia-Geneva Steel Co. will build a taconite ore-processing plant at Atlantic City, Wyo., $16,000,000.

Latter-day Saints Church will construct a $5,000,000 hospital at Ogden, Utah.

University of Washington, Seattle, engineering building, $1,000,000.

Air Force facilities:

Phoenix, Ariz., $11,582,000; Mountain Home, Idaho, $4,380,000; Glasgow, Mont., $29,644,000; Great Falls, Mont., $7,773,000; Tacoma, Wash., $4,995,000.

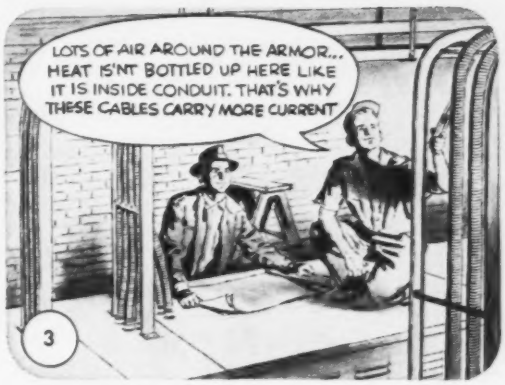
Labor and Industries Building at Salem, Ore., $3,000,000.

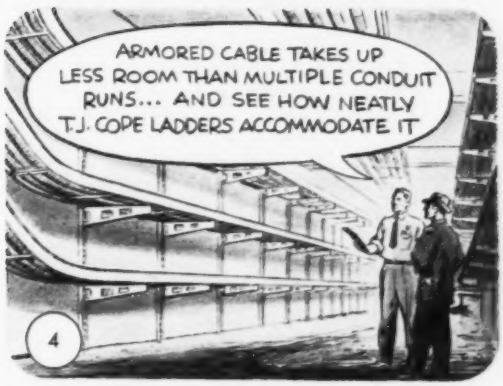
San Jose, Calif., voted bonds for school construction, $11,557,000.

Kennecott Copper Corp. plans power plant addition at Magna, Utah, $16,000,000.

Pulp and paper mill at Wallula, Wash., $15,000,000.

Office and parking garage for the California Bank, Los Angeles, $13,000,000.

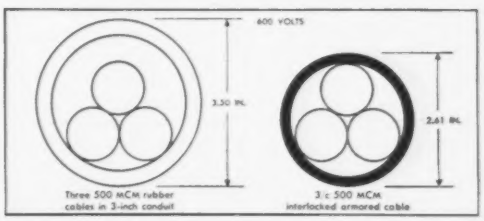

LOTS OF AIR AROUND THE ARMOR... HEAT IS'NT BOTTLED UP HERE LIKE IT IS INSIDE CONDUIT. THAT'S WHY THESE CABLES CARRY MORE CURRENT
3



For 600- to 15,000-volt service Rome's interlocked armored cable is available in three-conductor construction with Rozone A (butyl) insulation. It offers many more benefits than described here. For complete information, contact your nearest Rome Cable representative and ask for your free copy of Bulletin RCP-730. Or mail the coupon today.

ROME CABLE
CORPORATION

A matter of FACT



Reduced space requirements Less space is needed for Rome Cable's interlocked armored cable —almost one inch less width for each three-conductor 500 MCM interlocked cable than for cable-in-conduit type installations.

FREE BULLETIN describes all the benefits of Rome's Interlocked Armored Cable.

ROME CABLE CORPORATION
Department 731, Rome, New York

Please send me a copy of the new Rome Cable Bulletin RCP-730.

Name .....

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Address .....

.....

Type of business .....

EW news roundup

GROWTH—The atomic energy program of the electric utilities thus far has involved more than half a billion dollars of electric utility company funds in the 3½ years since Congress permitted the industry to own and operate nuclear power plants. Elmer Lindseth, president of the Cleveland Electric Illuminating Co. and head of EEI atomic activities, stated that 123 companies are now participating actively in a broad program aimed at bringing about economic nuclear power. Actual expenditures have increased from $14,000,000 in 1955 to $39,000,000 in 1957 and expenditures this year are expected to be at least $60,000,000. Nine projects in the atomic field either in operation, under construction or under contract will involve expenditures of over $320,000,000. Five projects that are now in the planning stage will require another investment of $200,000,000. Quite a record for 3½ years.

—EW—

Mixed emotions greeted the news that Washington Water Power might buy the local gas company in Spokane after just about running it out of business with a strong electric sales program. Objections to the merger seem to be brewing in unions and PUDs. Employees themselves were a little confused as to how to sell gas after having made electricity such a crusade.

—EW—

ODD-BALLS—A recent survey made among 48,000 high school students by the American Iron & Steel Institute indicates that teenagers in large numbers are not quite sure that scientists are people. The findings can't be viewed with complacency as the high school students came up with these observations:

30% believed one could not raise a normal family and be a scientist

25% thought scientists were more than a little "odd"

28% didn't believe scientists had time to enjoy life

And 14% thought there was something evil about scientists

Seems like a little cultivation is in order if the country is to harvest a bumper crop of scientists that it's going to need in the future.

—EW—

Herb Leggett, editor of Arizona Progress, reports that the doctors considered his recent heart attack merely "routine," like breaking your neck.

—EW—

We would like to learn the results of Seattle High school debates this year. The students are debating the question "Resolved: That the future development of hydroelectric power of the Pacific Northwest be privately handled." Joe De Leon, City Light's supervisor of advertising and information, met recently with one of the debate classes to answer questions on the subject.

—EW—

Get Off the Worry-Go-Round

Do you know how Winston Churchill cured himself of speechfright? Yes, he used to have it, just like most of us.

The story goes that Sir Winston suffered agonies before campaign speeches. But he gained confidence by reminding himself that he knew more than his audience about his subject.

Doctors agree that continued nervous tension can cause a variety of illnesses. If you're worried about making a speech, just remember that you're in good company. Arm yourself with plenty of information about your subject. Then HiTension won't have a chance to get started.

FCC RECOMMENDED – The National Society of Professional Engineers recently took a stand recommending the creation of a Federal Space Exploration Commission with full power and resources to undertake long-range space programs.

NSPE proposed that the administration present to the Congress a program for the national direction of space exploration encompassing as full and comprehensive a legislative structure as that embodied in the Atomic Energy Act.

The society's statement covered nine points, which would appear to bring some order out of the chaos presently found in the programs sponsored by the various branches of the military.

—EW—

HYDRO POTENTIAL—The Federal Power Commission's annual report for 1957 states that 90,000,000 kw of hydroelectric power capacity is theoretically available for future development. However, the report realistically explains that many potential projects may be uneconomic or unfeasible.

Of the total potential, 33,722,000 kw are in the Pacific states and 21,333,000 kw in the Rocky Mountain states. So far developed is only 26,500,000 kw. Leaves a lot of room for public vs private power hassels in the future.

—EW—

Construction prospects in the West aren't nearly as bad as reports from the east would indicate. One suspects the terrible weather back there depressed economic thinking, while good weather here kindles hope.

—EW—

BUSY – Frank Warren Jr., president of Portland General Electric Co. and a transplanted Stanford graduate, has been chosen to head a committee to raise about a million dollars for a new science building for Reed College.

Warren is a member of the board

LET'S GET DOWN TO EARTH

No fancy names — no confusing claims.
Just the best in wire and cables.

PORTABLE CORDS · WELDING CABLES · MINING MACHINE CABLE
LAMP CORDS · THERMOSTAT WIRES · POWER SUPPLY CABLE

When you call for cable, call for Carol

Carol®

CAROL CABLE COMPANY • Division of the Crescent Co., Pawtucket, Rhode Island

NEMA

NEW KLEIN

stripping tool

for all types of control cable

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2691822

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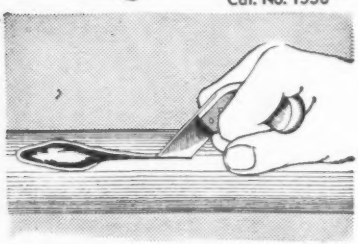


Here is a new tool developed by Klein, designed to strip insulation from all types of control cable, flexible cords, PWC, telephone cable with vinyl or polyethylene jackets and bus drop.

Handle of cast aluminum, light in weight and with convenient grip; knife of tempered tool steel may be sharpened and is easily removed for replacement. This tool strips insulation from a few inches to as many feet as desired swiftly and simply. Does not damage conductors inside weatherproof sheath.

Write for bulletin giving complete information.

FREE POCKET TOOL GUIDE

100 years of service to linemen, electricians and industry is back of this new Pocket Tool Guide No. 100. A copy will be sent you on request without obligation.

ASK YOUR SUPPLIER

Foreign Distributor: International Standard Electric Corp. New York

Mathias KLEIN & Sons
Established 1857 Chicago, Ill., U.S.A.
7200 McCORMICK ROAD • CHICAGO 45, ILLINOIS

Tsugio Nakafuji holds his Electrical West authors' plaque as he receives the compliments of Ralph B. Johnson, executive vice-president of Hawaiian Electric Co. Looking on are Carl H. Williams, left, manager of engineering, and Lewis W. Lengnick, vice-president and executive engineer. Underground distribution was topic

of trustees of the college, and has interested himself in its activities partly because of Reed's strong emphasis on scientific education.

The new building will have laboratory facilities and lecture rooms for biology and physics classes.

—EW—

"Energetically Yours" is the title of a new cartoon motion picture available on free-loan basis from Standard Oil Co., Room 1610, 30 Rockefeller Plaza, New York 20, N. Y. Theme of the picture is the way electricity benefits man—how it contributes to his better living—and man's unending search for new sources of energy. It was produced by Transfilm.

—EW—

WESTERNER PROMOTED—Some ELECTRICAL WEST readers will remember Robert E. Pierce, a former member of the operating department of Utah Power & Light Co., who was recently made chief consulting engineer for Ebasco Services Inc.

Pierce succeeds Howard L. Melvin, another former Westerner, who began his electrical industry career in 1919 when he joined Washington Water Power Co. He then saw some service with Utah Power & Light Co., and followed that by rejoining Washington Water Power. He continues on with Ebasco as a general engineering consultant.

LUCKY DAY — One of those incidents that are difficult to explain and that have electrical industry people talking to themselves much of the time occurred in Cambrian Park, Calif., recently.

At the height of a storm, a lady called the county fire department and told Captain Robert Basile:

"There's an electric wire down in my yard. I've tried everything, but it keeps smoking."

"What did you do, lady?" Basile queried.

"Well, first I went out and threw a bucket of water on it."

Basile gasped, and the woman added:

"But it just kept on smoking. So then I filled a cider jug full of water and went out and picked up the wire. I put the end of the wire in the cider jug, but you know, it still wouldn't go out."

"Are you hurt?"

"No. Why?"

"Just stay in the house, lady. Just stay in the house until we and the PG and E can get out there."

—EW—

LESSON—Dr. Emerson P. Schmidt, economic research director for the Chamber of Commerce of the United States, recently gave a simple lesson in economics. In essence it is this: "When any group of laborers receives higher money wages it is thus enabled to buy more goods so that its real income is increased. Its own higher wages raise the cost and hence the price of the goods it produces, and thus others are able to

buy fewer goods so that the real incomes of others are diminished.

"If wage increases become general, each laborer gains by his own higher money wages and has his gains pared down by the higher money wages of others, as these raise the prices of what he buys. If all money incomes increased proportionately, clearly the rise in prices would roughly cancel the gains generally and no one would have any higher real income."

Dr. Schmidt goes on to point out that some elements of society have the power to raise their money incomes but others, such as life insurance beneficiaries, pensioners and others have no way to do so. Thus union members, for example, have power to gain at the expense of those who have less.

—EW—

Jim Goggin, manager of community relations for Portland General Electric Co., reports that more than 50,000 people visited PGE's recreational areas in 1957.

—EW—

NOT HURTING – Len Hobbs of Smoot-Holman reports at least one section of the country where nobody has been crying the recession blues.

During a visit to Santa Maria valley in California, Hobbs visited electrical concerns in Ventura and Oxnard, where virtually everyone says there is plenty of work in the shop and the outlook for the immediate future is equally good.

As Hobbs sees it, one of the major reasons for this optimism is the federal government's $100,000,000 development program for Camp Cook.

—EW—

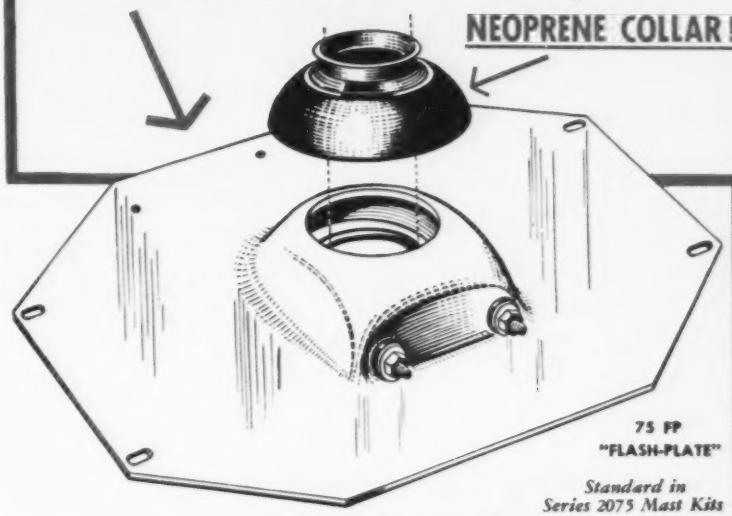
A new electrical heating method may be tried in the Northwest. It consists of a laminate of graphite in fibrous material. Current applied across it generates heat through its slow leakage and resistance of the carbon particles. It was shown at the Seattle Exposition.

—EW—

REFERENCE MATERIAL—If you haven't acquired them already, perhaps you would like to have for reference material two books published by the Montana State University.

They are reports of the first and

new from Porcelain Products . . . combination roof-plate and flashing with NEOPRENE COLLAR!



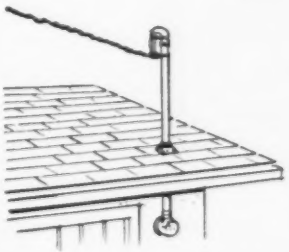
75 FP "FLASH-PLATE"

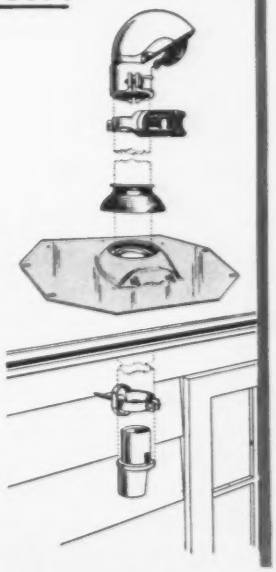
Standard in Series 2075 Mast Kits

Makes installation

- **QUICKER—fewer parts**
- **EASIER—no caulking**

at Less Cost!





Now, Porcelain Products Mast Kits feature FLASH-PLATE, a combined roof-plate and flashing, plus a lifetime, watertight Neoprene collar. The "one-piece" feature makes Porcelain Products Mast Kits easier to install . . . provides a stronger, longer lasting, safer entrance mast . . . ALL AT *LESS* COST TO YOU!

Flash-plate is heavy, 14 gauge galvanized plate. It supports a 2" or 2½" mast on any roof, neatly and effectively, *with no caulking* needed. Available through recognized electrical distributors or write for further information.

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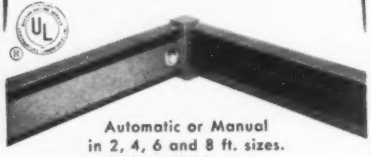
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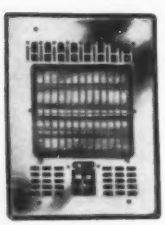
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second annual water resources conferences, and are entitled, "Is a Preference Among Distributors of Federal Power Justified?" and, "High Dams and Upstream Storage."

The books contain interesting information on both sides of both important questions. Your copies can be secured by writing to Jack Ryan, circulation manager, Montana State University Press, Missoula. Price of the volumes is not included in information sent to ELECTRICAL WEST.

—EW—

Norman Wicks, who has a wide acquaintanceship in the West because of his work with the National Electrical Manufacturers Assn., has been named executive director of the Plumbing, Heating, Cooling Information Bureau, with headquarters in Chicago. While with NEMA from 1948 to 1955, Wicks was assistant to the managing director, manager of the defense production project, manager of the business development department, and the National Adequate Wiring Bureau.

—EW—

SALARY LEVEL—A recent survey by Dun & Bradstreet indicates that the presidents of major U. S. industrial corporations earn an average of $111,500 a year in direct compensation. The presidents stated that after taxes and living expenses they had about 16 to 20% for voluntary spending.

As a measure of the salary scale, the presidents felt that their executive vice-presidents should be paid 72% of their own pay, the top marketing executive 56% of the president's pay, the top financial executive 55% and the top industrial relations executive 38%.

—EW—

HIGH FLYERS — This is the comic book season. Actually, it's the season when some invisible and unheard telepathic signal seems to strike the minds of boys all over the country, and soon the streets and vacant lots are filled with small fry and big kites.

It is the comic book season because utility companies throughout the West are using comic books as a means of communication to persuade future rocket ship pilots to keep their colorful playthings out of electric power lines.

We are waiting for a report on some power company employee who has cautioned his son not to fly kites, and who receives in turn the remark, "But, daddy, Tom Jefferson did it."

—EW—

The primary reduction plant of Harvey Aluminum at The Dalles, Ore., will have the largest aluminum bus conductor ever extruded, according to a report from Harvey Aluminum. Made at Torrance, Calif., the bus conductor measures 4⅛ in. by 20 in. in lengths up to 43 ft. Extrusion gives a better finish on the surface, and conductivity of the aluminum is improved because the grain flow is in one direction.

—EW—

We enjoy reading Solar Light Flashes, the publication of Sola Light Mfg. Co. It contains such enlightening information as: "The average employee going out for a coffee break, breathing naturally, travels about 10 ft during each breath," or, "Of course you've heard about the man who spent a small fortune to get rid of his halitosis—only to find out that people didn't like him anyway."

—EW—

BIG BUSINESS — U. S. manufacturers can look forward to an estimated four billion dollars' sales of equipment and components for U. S. and foreign nuclear reactors over the next 10 years, according to a survey completed by the Atomic Industrial Forum.

The survey shows that the nuclear industry is now building toward installation of more than 500,000 kw of nuclear power station capacity in the U. S. by 1960.

The report is limited in its scope to those aspects of atomic energy development dealing directly or indirectly with reactor systems. It does not include industrial involvement in the preparation and use of radiation sources, nor in the use of radioactive by-product tracer materials, nor in some of the other important aspects of nuclear research and development.

—EW—

MUSIC HAS CHARM—Muzak, a corporation that specializes in piping music into plants and offices, wrote us about a study made in the

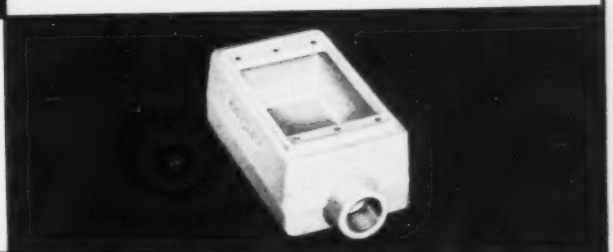
Cut costs... without cutting corners! Specify... GEDNEY CONDUIT BODIES

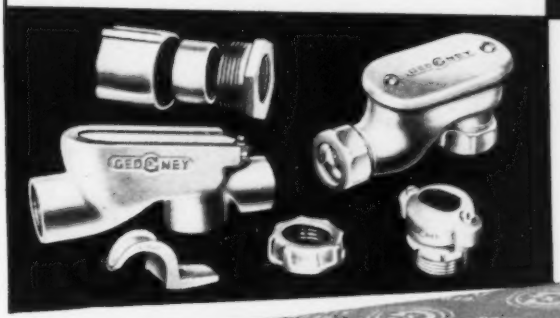
Gedney Conduit Bodies mean lowest installed cost! That's because they are skillfully made of tough, *malleable* iron, then hot-dip galvanized, and finally, they must pass the toughest inspection. Accurate machining and threading assure easiest installation . . . ruggedness assures longest service life!

THE GEDNEY CONDUIT BODY LINE INCLUDES ALL TYPES—SIZES ½" TO 4"

TYPE LB—Threaded—for heavy-wall rigid conduit. Use them with Gedney entrance fittings, straps, clamp backs to get an *entire* conduit system that is hot-dip galvanized.

TYPE FS—Threaded—shallow bodies for heavy-wall rigid conduit. Hot-dip galvanized finish prevents corrosive deposits—means easier installation, longer life.





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machine accounting and billing department of the Mississippi Power & Light Co. recently. After installing the musical background, key punch productivity jumped 18.6% from an average of about 950 cards per hour to over 1,100. The average number of errors per thousand cards was reduced from 2.6 per thousand in 1955 to about 1.5 per thousand or a decrease of 37%. The time required to process bills was cut from an average of 3.01 days to 2.58 days or a reduction of 16%.

Wonder what effect music will have on electronic brains?

—EW—

A new safety rule interpretation by the Washington State Commission sounded more like feather-bedding than sense. It would require utilities to keep foremen of small crews from lifting a finger—just stand around and be executives.

—EW—

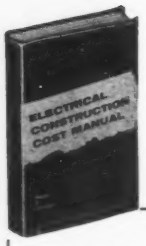
EDUCATION — Surveying the status and needs of research in American engineering colleges, the American Society for Engineering Education recently made five points.

1. Engineering research valued at $100 million a year is now in progress on college campuses.
2. Another $10 million could be accommodated with today's staffs.
3. Engineering progress in future years will require a greatly expanded program of basic research today in all technical fronts.
4. Increased support of research in educational institutions is vital both from the point of view of the new technologies that will result, as well as the value to the individuals participating in the research.
5. Budget cuts during 1957 have damaged the good relationships built up between the Defense Department and educational institutions.

—EW—

CHANGE-OVER — It is predicted by H. Dewayne Kreager, Washington State Director of Commerce and Economic Development, that within 10 years coal from the state-owned mines will be supplying a large part of the state's power needs. He said hydroelectric plants soon may . . . "price themselves out of the market."

Discussion of the subject of steam generation came up at the seventh conference of Coal Research Inc., held Feb. 28 at Renton.



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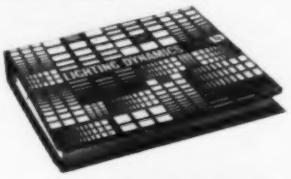

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For dependable performance . . . insist upon Crapo Galvanized Steel Strand. Superior tensile strength, combined with long-life, ruggedness and workability, makes Crapo Steel Strand first choice for guys, messenger and overhead ground wire.

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To meet this challenge,
EKCO PRODUCTS COMPANY,
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And to ensure the highest quality control there are new photometric laboratories, new Ransburg double electrostatic painting equipment, and a new multi-stage Bonderizing process.
WRITE FOR: *the completely new catalog.*
LIGHTING FOR TOMORROW'S MAN
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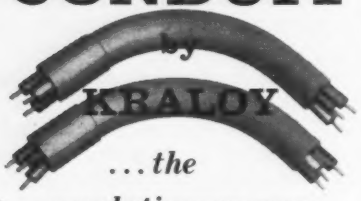
NEW
PLASTIC PVC
CONDUIT



... the revolutionary new electrical conduit with these distinct advantages:

- WILL NOT SUPPORT COMBUSTION
- RUST AND CORROSION-FREE
- SIMPLIFIED INSTALLATION
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- MOISTURE PROOF • LONGER LIFE

Kraloy PVC (rigid, unplasticized polyvinyl chloride) Conduit is in demand as a strong, economical, light-weight, permanent conduit for all power and communication wire installations within its size limitations. Inside diameters have been engineered to Underwriters' conduit specifications.

Today, engineers specify Kraloy PVC Conduit and fittings for their electrical installations for good reason. Kraloy is easy to install, has safer, longer lived physical properties, reduces cost of installation and materials by *more than half*, and is steadily earning the approval of municipal authorities.

Because of its semi-rigid construction, Kraloy PVC Conduit is easily worked into contours. Its high-impact rating guards against earth movements and shocks of all kinds.

In exhaustive tests Kraloy PVC Conduit has proved to be a far superior, safer and more economical conduit.

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Some territories still open for qualified representatives.

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KP-113

Within the same conference, however, discussion of other uses for coal revealed the possibility that in 15 years coal may be "too valuable to burn." This was the view of Ralph Law, research chemist of the National Resources Research Institute, Laramie.

—EW—

NOTES FROM THE 1958 NUCLEAR CONGRESS

Dr. Malcolm J. McNelly of Canadian General Electric reported, "The scope offered by organic coolants for heavy water moderated power reactors has justified the initiation of design and development directed toward plants ranging from process steam plants of 80 mw thermal rating to central station power plants of at least 300 mw electrical rating."

A. C. Jealous and **R. J. Klotzbach** of Union Carbide Nuclear Co., reporting on thorium recovery costs, stated, "The estimated bare unit reprocessing charge to the utility is 1.12 mills per kwh of electricity before provision for profit and federal income tax; for a 30% return on the investment, the unit reproc-

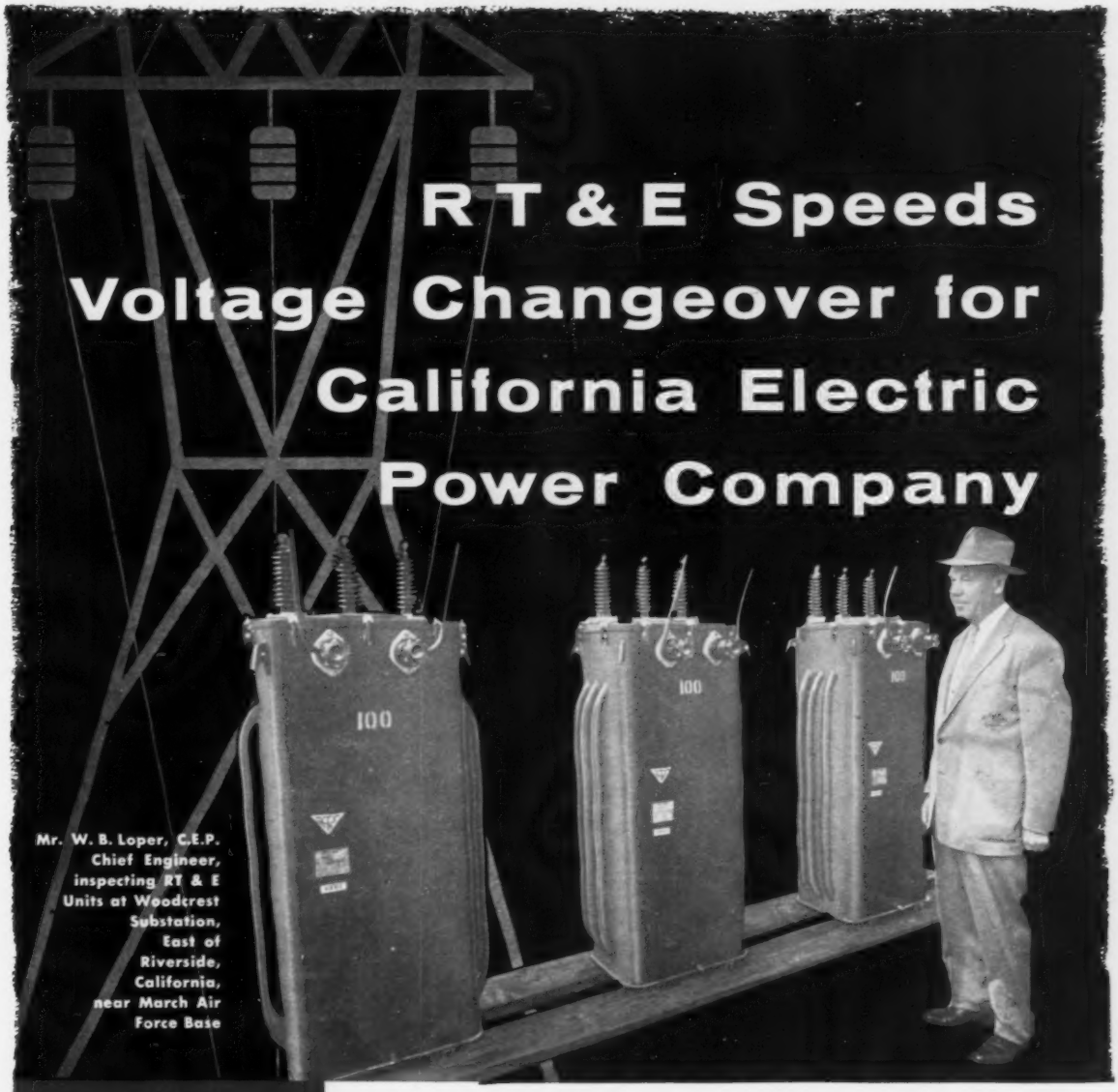
Test yourself on

Your Ability to Delegate Authority

Success in administration has been demonstrated to require certain skills and attitudes. This is the fourth of a series of self-tests which will appear in ELECTRICAL WEST during 1958. The answers will be found on page 99.

	True	False
1. Good supervisors have to work longer hours than their subordinates.	.....	.....
2. When you give a man an assignment, it is advisable to keep your suggestions as to how to do it to yourself and let him figure it out completely by himself.	.....	.....
3. A good executive permits workers to come to him to ask for reconsideration of decisions of their immediate bosses.	.....	.....
4. Adequate "follow-up" on assignments is liable to make subordinate executives feel that you do not fully trust their abilities.	.....	.....
5. A good supervisor accepts and encourages suggestions from subordinates but makes all final decisions about his operation himself.	.....	.....
6. A good supervisor is unselfish with his time, making himself available to subordinate executives to give advice and answer questions.	.....	.....
7. It is easier and more efficient to staff your organization with men who will follow instructions than with men who try to do things their own way.	.....	.....
8. A good executive must accept final responsibility for the operations of his department. Therefore, he should not risk his reputation by turning over to a subordinate the whole authority for getting a part of the job done.	.....	.....
9. Any supervisor who really has the company's interest at heart can do his job well.	.....	.....

R T & E Speeds Voltage Changeover for California Electric Power Company



Mr. W. B. Loper, C.E.P. Chief Engineer, inspecting RT & E Units at Woodcrest Substation, East of Riverside, California, near March Air Force Base

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Waukesha, Wisconsin

Equipment to help provide power for America

California Electric Power Company faced the problem of making a rapid cutover . . . in areas served from distribution circuits of 2400, 4160, and 4800 volts delta and wye . . . to 12,000 volts.

Mr. W. B. Loper, Chief Engineer of California Electric Power, found after careful study that these cutovers could be made faster and more economically if special 100 KVA transformers were available.

The problem was presented to the R T & E Engineering Department, where swift and careful attention to the problem resulted in a specially designed transformer capable of transforming all three voltages to the 12 KV level.

These special units were manufactured and delivered in record time to meet an emergency condition, saving the utility time and money. Electrical characteristics proved to be excellent, and cutovers were made on schedule.

This type of special service is another reason why R T & E Transformers are being specified by more and more utilities the nation over.

NEW All-American!

Spir-O-line®

SEMI-FLEXIBLE ALUMINUM TRANSMISSION LINE

Compressed and profiled high strength 100°C polyethylene or 250°C teflon dielectric structure providing the highest transmission efficiencies for any impedance desired.

UNIQUE! ADVANTAGES of SOLID and AIR DIELECTRIC LINE COMBINED by Prodelin in revolutionary All-Aluminum Cable and Connector

*Spir-O-line** — Prodelin's latest contribution to air-dielectric transmission — combines the low loss of air dielectric with the high power of solid dielectric lines by using dielectric tubes compressed and profiled into a symmetrical supporting structure. *Spir-O-line* is available in continuous lengths up to 1000' with reliably low VSWR and 50, 70, 75 ohm, and other impedances; the 50 ohm line usable up to these cut-off frequencies: ⅜" - 15.0 Kmc; ½" - 10.0 Kmc; ⅞" - 5.0 Kmc; 1⅝" - 2.8 Kmc; 3⅛" - 1.5 Kmc. The normally non-corroding aluminum-alloy outer conductor is available with a non-contaminating polyethylene jacket for caustic environments.

FEATURES

- No special techniques or tools required to make up cable-connector assembly
- No metallic welds or dielectric splices are used regardless of cable length
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- Dielectric structure makes continuous and intimate line contact with both conductors without spiraling — yielding best broadband performance, highest power handling capacity, lowest attenuations, and VSWR smoothness
- Both cable and connector available for −90°C to +250°C operation
- Terminates in standard EIA (RETMA) dimensions

PLUS

Spir-O-line Connector*

Amazing Prodelin development! Adequately pressure-tight for lab use when hand-tightened . . . ready for field service when wrench-tightened. Specifically designed for use with soft aluminum tubing to provide highest tensile strengths without tube distortion. No special techniques, bulky fixtures, or non-standard tools required. *May be used again and again without redressing tubing or replacing connector parts!* Saves time and money! RETMA dimensioned.

Specify Spir-O-line HI-TEMP with Teflon for 250°C operation

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essing charge is 2.4 mills per kwh of electricity." Considering the economies of larger capacity reprocessing plans, they indicate that with 950 mw of installed electrical capacity, unit fuel charges would be reduced to less than 1.0 mill per kwh, including a reasonable return on the investment.

W. H. Truran of General Electric Co. declared, "Automatic radiation monitoring and analytical equipment will provide for future nuclear power plants a radiation protection program which is less obstrusive and less costly (than today)." Such a system, he stated, for radiation protection, should save $102,000 annually in manpower, space and supporting laboratory equipment.

Lester Kornblith Jr. of Vallecitos Atomic Laboratories said, "Our experience, in general, indicates that steam and electric instrumentation can very nearly follow standard power plant practices and reactor instrumentation can be much simpler than that proposed for some installations. It need not, in fact, be much more complex than the instrumentation of an equivalent fossil fuel fired plant."

—EW—

DO-IT-YOURSELF — Thomas Industries Inc. is taking the hardware store route to find new buyers for its "Star Light" lighting fixtures.

Four of the fixtures are boxed together and presently on display at nearly 10,000 hardware stores across the country. Prices are reduced about one-third as further inducement to the do-it-yourselfer to cart the package home.

—EW—

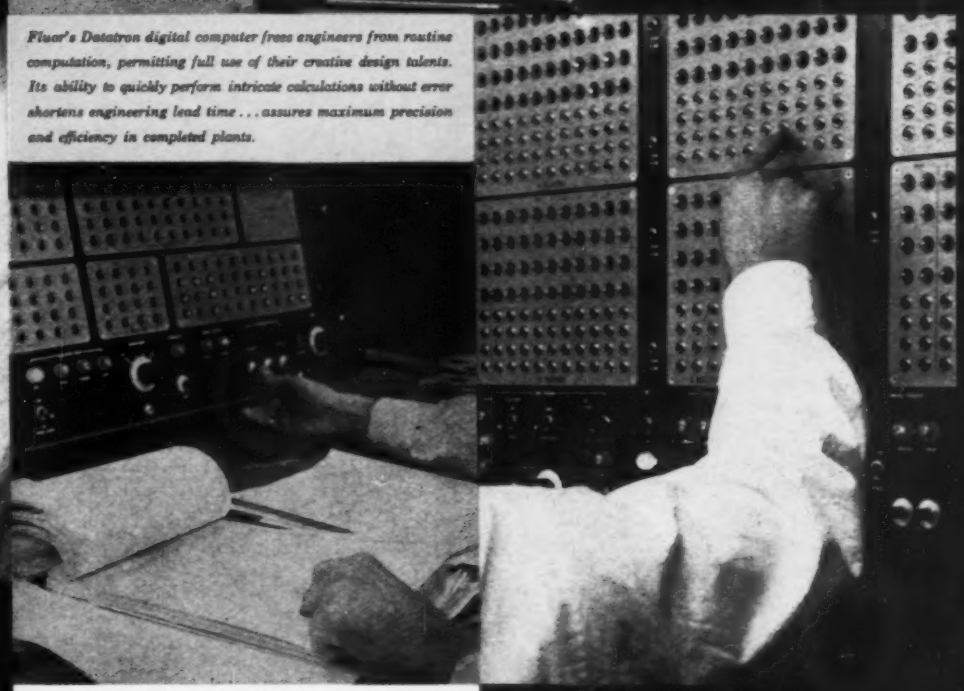
NAMESAKE — The Warm Springs Indians, who are "partners" in Portland General Electric's Pelton project, have named the eight-mile lake formed in the Deschutes River canyon after a tribal hero who fought as a U. S. cavalry scout against the Warm Springs' old enemies, the Piutes, Banocs and Modocs.

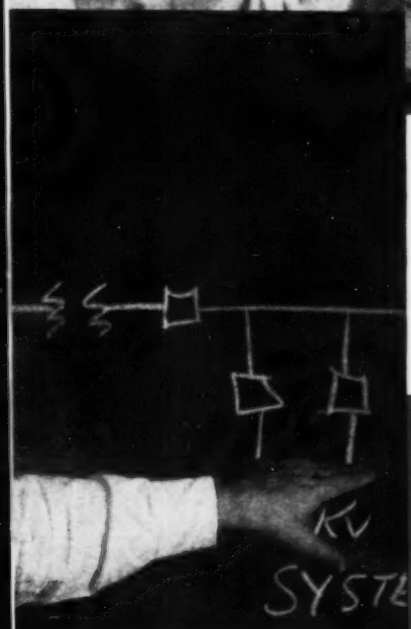
It will be Lake Sim-tus-tus.

Sim-tus-tus died in 1926 at age 87. He had urged the tribal members to hold on to their lands.

Pelton Dam is built on the Warm Springs reservation. Under terms of PGE's agreement with the tribal council, the tribe receives a monthly payment of 4¢ per kilowatt of installed capacity, and one-tenth mill per kilowatt generated. In January, first full month of Pelton operation, the tribe received $7,358.50.

Fluor's Datatron digital computer frees engineers from routine computation, permitting full use of their creative design talents. Its ability to quickly perform intricate calculations without error shortens engineering lead time . . . assures maximum precision and efficiency in completed plants.

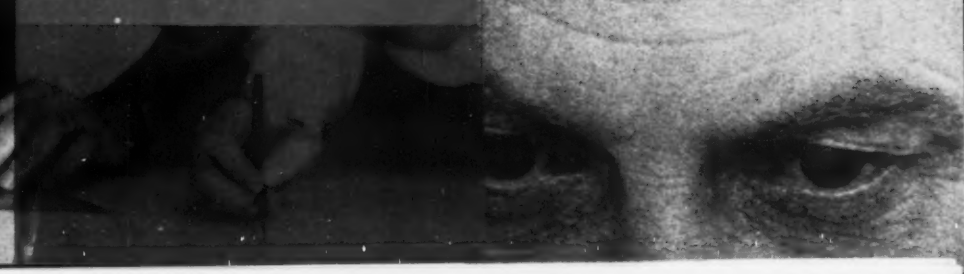




WHEN you consider expansion...
the most important investment
you can make is in
the creative ability of men.

FLUOR

The Fluor Corporation, Ltd.
Engineers & Constructors
2500 S. Atlantic Blvd., Los Angeles



RATIO TEST double checks exact number of turns on each coil against automatic count of winding machines.

CORE LOSS AND COPPER LOSS TESTS determine the excitation loss, impedance and load losses at rated current.

WAGNER FORM W TRANSFORMERS
PERFORMANCE-PROVED BY TESTS

The extreme care used in building Wagner Form W Distribution Transformers starts with advanced engineering design and rigid quality control of all materials used in the transformers. It is carried on by highly skilled workers through every step of assembly. And, it is *proved* by exacting inspections and tests to assure that every Wagner Form W Transformer has the ability to provide many years of trouble-free service.

Electrical tests at various stations along the production line include all commercial tests prescribed by ASA and NEMA. Mechanical inspection includes tests for possible leaks in welded seams or around bushings.

All Form W Transformers, in ratings 3 through 167 kva, 15 KV and below, are designed for pole mounting. Form W Transformers are available for every requirement of modern distribution systems—500 kva and smaller, 69 KV and below.

You can choose either conventional or protected type Form W Transformers for your distribution lines with full confidence that they will pay dividends in longer service life.

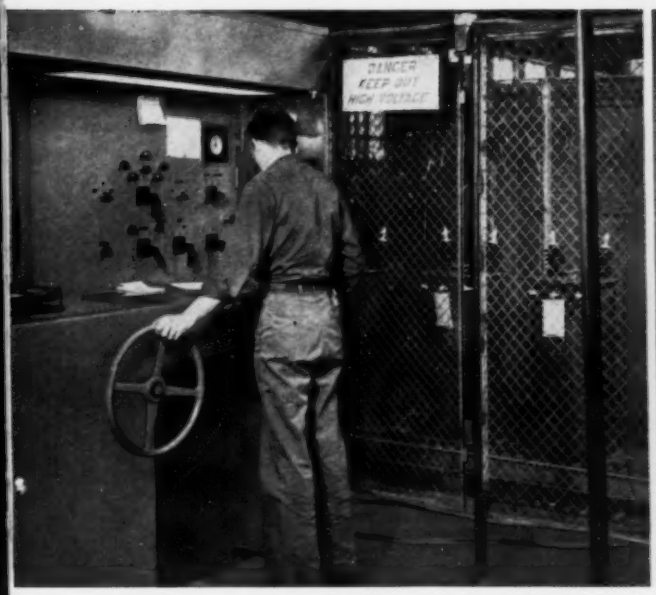
Bulletin TU-141 gives complete information on Wagner Form W Distribution Transformers. Write for your file copy today.

Wagner Electric Corporation
SERVING INDUSTRY SINCE 1891

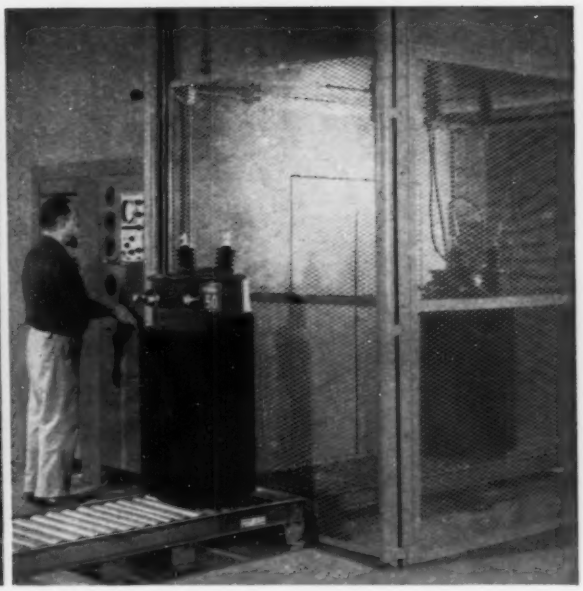
BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

Wagner Electric Corporation
6381 Plymouth Ave., St. Louis 14, Mo., U.S.A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

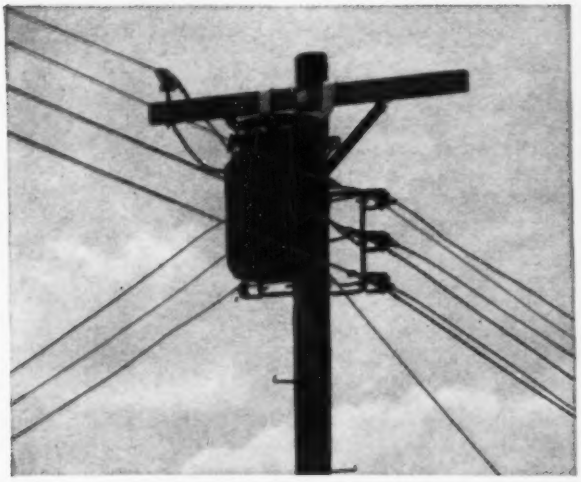


GROUND AND DOUBLE NORMAL TEST. Complete transformers are given dielectric tests for applied potential and induced potential.



IMPULSE TESTS prove the ability of every Wagner Form W Transformer to operate under greater stresses than it will meet in normal service.

TO PROVIDE LONGER SERVICE LIFE!



Today's Wagner Form W Transformer is exactly right for modern distribution systems. Its small size and light weight make it easy to handle—to store—to mount on poles.

LIVE BETTER ELECTRICALLY

WT58-10

Craftsmanship at Allis-Chalmers

...includes 10 operations to protect

Tank Surfaces

of Distribution Transformers

Advanced engineering, scientific precision and manual skill at Allis-Chalmers extend to every detail of manufacture, including surface finishing. The tank treating process exposes all tank surfaces to five separate chemical and cleaning baths and converts surfaces to a non-metallic phosphate coating.

Synthetic resin base enamel is hot sprayed on tank for both prime and second coat. Both are oven baked. After the transformer is completely assembled it gets its final protective coat of enamel.

This process gives Allis-Chalmers distribution transformers a surface resistant to severest weather conditions, salt and acid atmosphere conditions. The gleaming, gray surface of Allis-Chalmers tanks substantially reduces troublesome corrosion problems.

Extra "Measure" of Corrosion Protection

Magnetic gauging of paint coverage is still another example of the craft and precision in every step of manufacture. Painted tanks are gauged to assure uniform, specified paint thickness when finished.

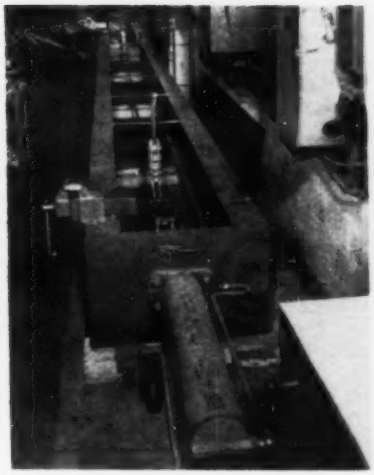
For the complete craftsmanship story, see your A-C representative or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS A-C ALLIS-CHALMERS

A-5556

PRODUCT NEWS

New Designs and Applications



Strain Clamp

(1) *Anderson Electric Corp., Birmingham 1, Ala.*

This new aluminum transmission strain clamp features a noncorrosive aluminum body and keepers that eliminate the need for ribbon or liners, the manufacturer reports. A flared mouth at the cable entrance protects the conductor against chafing. Jumper connections are eliminated because the design permits continuous conductor.

Circuit Breaker Enclosures

(2) *General Electric Co., Circuit Protective Devices Dept., Plainville, Conn.*

A complete new line of molded case circuit breaker enclosures in general purpose and raintight designs has been announced by this company. The enclosures are stocked separately to increase flexibility of application with lowest investment in the purchaser's inventory. The new enclosures are equipped with insulated groundable neutrals in all devices through 100 amp. Neutrals are not included in enclosures rated 225 amp and higher, but may be ordered separately if required. Savings in wall space are said to be as much as 30% in some of the enclosures. Available in flush and surface mountings with either external handle operating or handle-through-cover operation.

Three-Pole Breakers

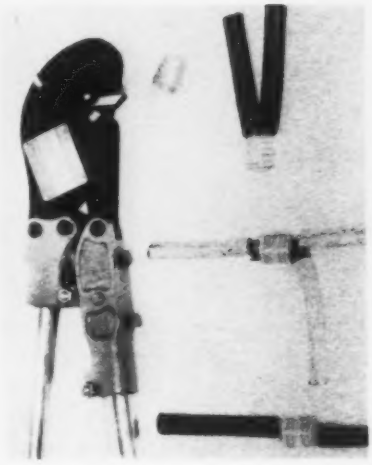
(3) *Federal Pacific Electric Co., 50 Paris St., Newark 1, N. J.*

A complete line of three-pole plug-in circuit breakers in ratings from 15 through 70 amp, 240-v, has been announced by this company. The new units are a further extension of the firm's single- and double-pole Stablok circuit breaker series. They are designed to serve as main disconnects in standard lighting, power and combination panelboard, and can also be used for three-phase motor circuit, original equipment and other machinery applications. Features are single-handle operation and snap-in locking hasp that can seal the breaker in the ON or OFF position in compliance with motor circuit code requirements.

Aerial Lift

(4) *Truck Equipment Co., 3961 Walnut St., Denver, Colo.*

A new aerial lift offered by this company is said to do a wide variety of lift functions safely. Insulation is with fiber glass. The unit mounts on open-type standard service or utility bodies, and is provided with counterbalancing that permits carrying a man safely while the truck is moving, the manufacturer reports. The controls are at the basket.



Compression Joints

(5) *Thomas & Betts Co., 36 Butler St., Elizabeth, N. J.*

A line of compression joints for pigtailing or splicing multiple copper conductors has been introduced by this company. The new joints will take a variety of wire combinations with diameters less than or equal to two 1/0 copper conductors. The manufacturer states that a combination of hand tool installation and color-keying assures a joint of high pull-out value and low resistance. Conductor sizes are color-keyed to dies in the compression installation tool.

Post-Type Insulator

(6) *Ohio Brass Co., Mansfield, Ohio*

This company announces a new post-type insulator designed for economical installation wherever a cantilever strength of 1,500 lb is adequate for distribution conductors. Pole-top and angle brackets are available for every mounting need. An especially wide conductor groove accommodates all common types of distribution conductor for voltages up to 25 kv. Available in 7- and 9-in. porcelain sizes.

For Coupon and Bulletins, See Page 32

Cable Ladder Supports

(7) *T. J. Cope Division, Rome Cable Corp., Collegeville, Pa.*

This company has added an extensive line of galvanized steel cable fittings and accessories to its list of cable supporting systems and equipment. The new cable ladder comprises a system of interconnecting steel parts and associated fittings for the support of interlocked armored cable. The ladder consists of parallel stringers with slotted rungs for securing cables. Straight sections are available in 12-ft lengths and a variety of widths. Rungs are spaced from 6 in. to 18 in. intervals.

Stop Joints

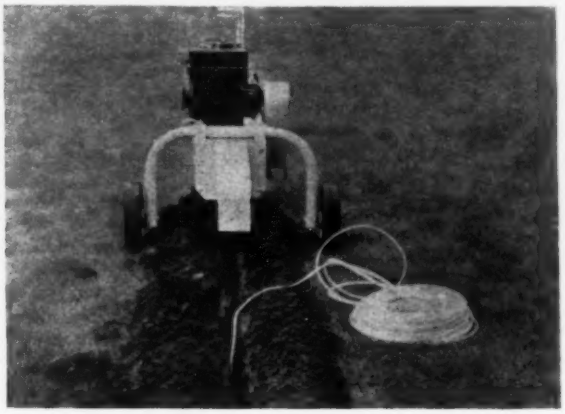
(8) *G & W Electric Specialty Co., 3500 W. 127th St., Blue Island, Ill.*

Stop joints to interconnect power cable systems having up to 200 psi nominal pressure differential on the pressure media have been developed by this company. The joints may be adapted to all high-voltage power cable systems. Designs are for conductor sizes up to 2,750 mcm. Stop joints are comprised of two potheads enclosed in an oil-filled nonmagnetic steel casing.

Specialty Transformers

(9) *Westinghouse Electric Corp., Box 2099, Pittsburgh 30, Pa.*

This company announces a new line of dry-type specialty transformers with sound levels averaging 5 db below NEMA standards. The units are 55% smaller and 14% lighter than previous models. Available in ratings from ¼ to 10 kva, 600 v and below, and can be mounted in any position on wall, floor, or ceiling. Ratings 3 to 10 kva are suitable for outdoor use.



Trenching Machine

(10) *Cosom Engineering Corp., Minneapolis, Minn.*

An automatic trenching machine that saws through hard ground makes it possible to lay plastic pipe or underground electrical cable quickly and with a minimum of torn-up earth, according to this manufacturer. The hardened steel teeth of the saw cut a sharp, clean trench 2¼ in. wide. Three models available: trench to depths of 12, 18 or 24 in. The machines have a 2¾-hp Briggs & Stratton engine with a six-to-one gear reduction, and fully enclosed drive. They can be operated at speeds up to 3 ft per minute. Photo shows the installation of electrical cable insulated with Bakelite vinyl resins.

Metal-Clad Switchgear

(11) *General Electric Co., Schenectady 5, N. Y.*

What is said to be the electrical industry's first line of metal-clad switchgear with two-cycle, 13.8-kv magnetic air breakers is announced by this manufacturer. It is designed to minimize damage that can result from line burning, and is interchangeable with existing magneblast breakers within rating. A two-cycle, 4.16-kv unit is also available.

For Additional Information and Manufacturers' Bulletins Fill in the Coupon on Page 32

GUY-GRIP dead-ends...

the modern twist in guying

The picture comparison makes GUY-GRIP dead-end benefits obvious.

1. THE ASSEMBLY LOOKS BETTER...
slim, modern GUY-GRIP dead-ends, free from bolts, give your guying jobs a finished, craftsmanlike appearance.

2. YOU SAVE *HOURS* OF COSTLY TIME...
takes only a minute to install a GUY-GRIP dead-end—about the same time spent in securing one nut and bolt.

3. YOU ELIMINATE ALL TOOLS...
wrenches, pliers, and other tools are completely unnecessary in applying GUY-GRIP dead-ends. The operation is done entirely by hand.

4. ASSURES POSITIVE GRIP...
under all field conditions, whether the guy is relaxed or under tension. Once the legs of the GUY-GRIP dead-end are entirely applied to the strand, you *know* the assembly is complete and permanent.

5. RESISTS STRAINS AND WEATHER...
GUY-GRIP dead-ends can take an unbelievable beating. Tension, impact, temperature extremes . . . whatever force is exerted against GUY-GRIP dead-ends, they withstand the most extreme conditions, never relinquishing a single ounce of their gripping power.

These are only a few of the many reasons why you might want to try the modern twist in guying. Write for more information: Preformed Line Products Company, 5349 St. Clair Avenue, Cleveland 3, Ohio. Cable Address: Preformed-Cleveland.

PLP 10 YEARS OF Power Line Progress

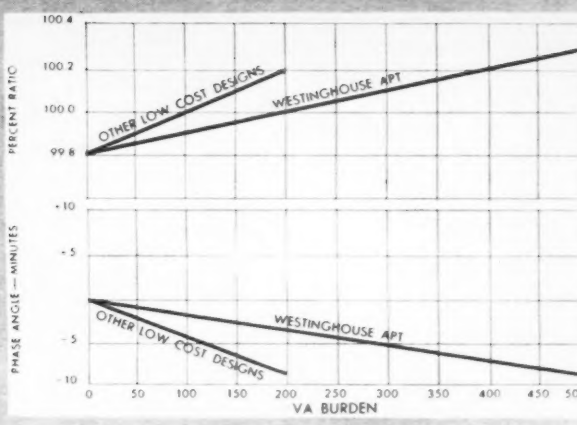
You can look up to

Preformed

Made in accordance with or for use under U. S. Patent No. 2,761,273; other patents issued and pending.

Westinghouse APT
potential transformer . . .
92 through 230 KV . . .

50% MORE
THERMAL CAPACITY . . .
GREATER ACCURACY



Westinghouse APT transformers meet ASA 0.3 accuracy standards through 500 volt-amperes burden at the price you'd pay for a competitive unit with 0.3 accuracy through only 200 va . . . Here's extra capacity for future load growth —without extra cost.

Thermal rating . . . 6500-va minimum for 115-kv APT compares with only 4000 va for other low-cost designs.

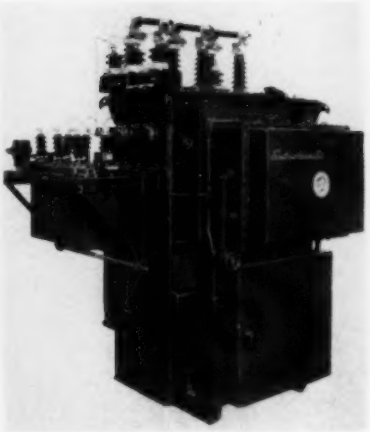
The Westinghouse APT is not a cascade design. It is a modification of conventional Westinghouse OPT designs, utilizing a solid insulation principle made possible by advanced knowledge of insulation application. Result: an equivalent-priced but less complex (single core and coil) design than the cascade-type construction.

Single-piece porcelain and welded tank construction reduces possibilities of gasket leaks.

Call your Westinghouse representative for the full performance story on the APT transformer—another example of Westinghouse leadership in transformer design, made possible by Plowback of Earnings into research and development.

J-70866

YOU CAN BE SURE...IF IT'S Westinghouse



Substation

(12) *Pennsylvania Transformer Division, McGraw-Edison Co., Box 330, Canonsburg, Pa.*

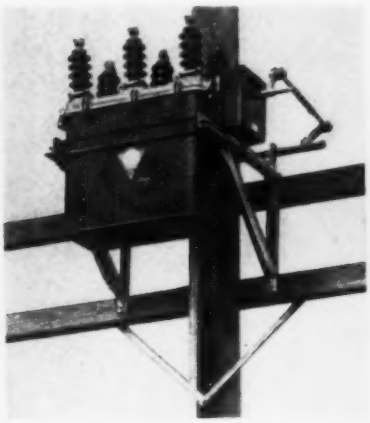
This company announces the development of a new substation that is specifically designed for rural areas, small towns and outlying industrial plants. It utilizes an automatic recloser rather than oil or air circuit breaker. Other equipment includes metering devices, load tap changing equipment in the low voltage, high- and low-voltage arresters, and high-voltage fuses. It is generally recommended for applications through 2,500 kva, but may be used for larger ratings within the capacity of reclosers, according to the company. High voltages range from 15 through 69 kv, and low voltages from 2.4 through 15 kv. Either one or two circuits may be provided.

Mercury Transformer

(13) *Sola Electric Co., 4633 W. 16th St., Chicago 50, Ill.*

A new weatherproof and watertight constant wattage mercury lamp transformer for one H-1 400-w mercury lamp has been announced. The new transformer is said to be 20% lighter and 25% smaller than previous models. Current crest factor is said to be less than 1.7, and open circuit voltage over the entire range is 300 v minimum.

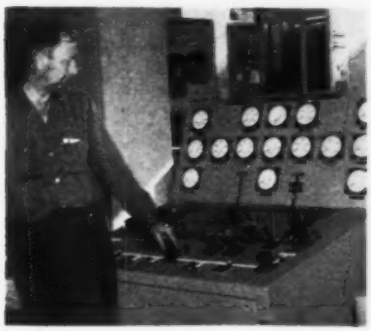
For manufacturers' bulletins with additional information on these products, fill in coupon on page 32



Oil Switches

(14) *Line Material Industries, McGraw-Edison Co., Milwaukee 1, Wis.*

New switches especially designed to operate at low power factors augment the line of three-phase, outdoor, type V switches manufactured by this company. Rated at 15 kv, 400 amp and 110-kv BIL, the new switches are said to offer dependable low cost switching for sectionalizing and load-break applications on highly inductive loads. Can be applied to systems with phase-to-phase ratings of 14.4 kv and below. Three different models available are hookstick operated, motor operated, and manual-remote handle operated respectively.



Switchgear Tester

(15) *Nelson Electric Mfg. Co., Tulsa, Okla.*

A new apparatus for testing switchgear components was demonstrated recently to the Tulsa Section of AIEE by R. H. Davidson (pictured). The switchboard tester checks the metering and relaying circuits of electrical control equipment used in refineries and other industrial plants.

Meter By-Pass

(16) *Murray Mfg. Corp., 1250 Atlantic Ave., Brooklyn 16, N. Y.*

A manual by-pass designed for a safe, positive means of furnishing continuous service during meter removals and replacement is announced by this company. It is designed to fit presently acceptable size troughs, and the unit eliminates need for large, unattractive cabinets with extra covers, blocks and seals, according to the manufacturer. Unauthorized current diversion is unlikely since the device cannot be operated without first removing seal and meter ring. No special jumpers are required, and the meterman needs only a screwdriver to engage and disengage by-pass.

Insulation Stripper

(17) *Mathias Klein & Sons, 7200 McCormick Rd., Chicago 45, Ill.*

This new tool is designed for stripping insulation from all types of control cable, flexible cords, PWC, telephone cable with vinyl or polyethylene jackets and bus drop. The knife is of tempered tool steel and may be sharpened or removed for replacement.

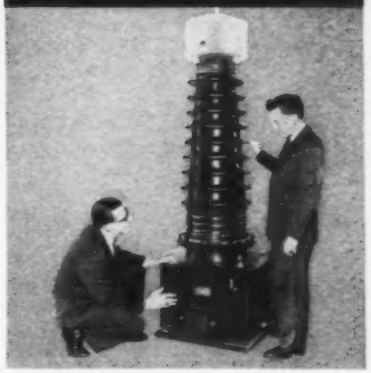
Dust-Tight Unit

(18) *Holophane Co. Inc., 342 Madison Ave., New York 17, N. Y.*

This new enclosed prismatic lighting unit is listed by Underwriters' Laboratories for use as dust-tight in class II, groups E, F and G and class III locations. The prismatic glass reflector and refractor combination, designed for 200-w lamps, is said to provide 52% output in the 0°-60° zone and 86% over-all.

Westinghouse
type APT
potential
transformer

SAVES 40%
ORIGINAL
COST OVER
CONVENTIONAL
DESIGNS



The Westinghouse Type APT potential transformer is designed for low-cost positive protection and greatest metering accuracy. Its design—single-core-and-coil and single-bushing—provides a saving in original cost over conventional design units . . . without sacrificing either accuracy or protection.

The APT meets all ASA standards for high-voltage metering and relaying applications . . . it's the Westinghouse answer to your demands for *high* accuracy at a *low* cost.

J-70865

YOU CAN BE SURE...IF IT'S
Westinghouse

Pictured (left to right) Alfred Scheer, Shaw, Metz & Dolio electrical engineer; George Nejdl, asst. electrical engineer for Shaw, Metz & Dolio; P. R. Ellingson, plant engineer, Johnson Motors; R. S. Terhune, Nelson sales representative.

NELSON

helps make your Johnson outboard motors

Seven Nelson unit substations similar to the one pictured above were used in the new Johnson Motors die cast expansion at Waukegan, Illinois. Each unit, compactly designed for ease of operation and maintenance, controls the flow of power to a section of the plant.

The unit shown is substation No. 3. This is a 1,000 KVA unit, rated 12,000 volt delta primary to 480 volt Wye 277 volt secondary, and incorporating Nelson Class 722 low voltage switchgear. This gear includes 1 — 50,000 AIC main and 8 — 25,000 AIC feeder breakers, and has fully equipped spaces for five additional future feeder breakers.

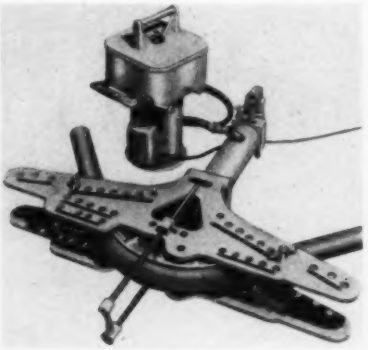
Thanks to the close cooperation on the part of Shaw, Metz & Dolio, architects and engineers of Chicago, the engineer at Johnson Motors, and the contractor, Aldridge Electric Company with Nelson Electric Manufacturing Company, this installation was made to the *complete satisfaction* of all parties.

When you need any type of electrical control equipment, consult NELSON. The type of team work that made the Johnson Motors installation possible can help you streamline your plant for more efficient operation.

To learn more about Nelson Electric Manufacturing Company please write for pictorial index and brochure describing our new plant.

a major source of electrical control equipment for industry

NELSON *Electric* MANUFACTURING CO.
TULSA, OKLAHOMA



Bender Motor Pump

(19) *Tal Bending Equipment Inc., Milwaukee 2, Wis.*

This manufacturer has developed a small powerful, portable hydraulic motor pump developing up to 10,000 psi pressure, and weighing only 65 lb. Though it is designed to be used with hydraulic pipe benders, it can also be used for pipe pressures, knockout punches, hydraulic jacks of any kind, and can be installed and adapted to give fast, continuous power to existing equipment. Rated for 10,000 psi intermittent and 5,000 psi continued duty, delivering 80 cu in. of oil per minute, and is driven by standard ½-hp single-phase, 60-cycle 110/220-v motor.

New, Bigger Cab

(20) *Four Wheel Drive Auto Co., Clintonville, Wis.*

A new specially designed two-man cab is now available for this company's Blue Ox Utility digger, the new rubber-tired earth-boring and pole-setting tractor recently announced for utilities and utility contractors. The unit may also be outfitted with canopy instead of the enclosed cab.

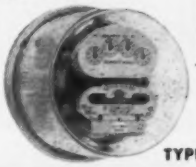
Explosionproof Fixture

(21) *Crouse-Hinds Co., Wolf & Seventh N. St., Syracuse, N. Y.*

Particularly suited for high-bay applications, this new explosionproof fixture for use with mercury vapor lamps is said to have increased lamp life and to give greater lumens per watt. The fixture will take 250-w type BT-28 and 400-w type BT-37 mercury vapor lamps. Ballasts used with mercury vapor lamps should be located outside the hazardous area, the manufacturer states.

AN IDEA PIONEERED BY DUNCAN

Duncan pioneered the Class 200 rating with the "Extended Range" Type MF-SE meter introduced eight years ago. This "50 amp" singlephase meter provided capacity to 200 amps. Within two years, Duncan also made 200 amp "extended range" capacity available in the Type MH polyphase meter.



TYPE MF-SE (1949)

CLASS 200 RATINGS *for More "Housepower!"*

30 AMP.

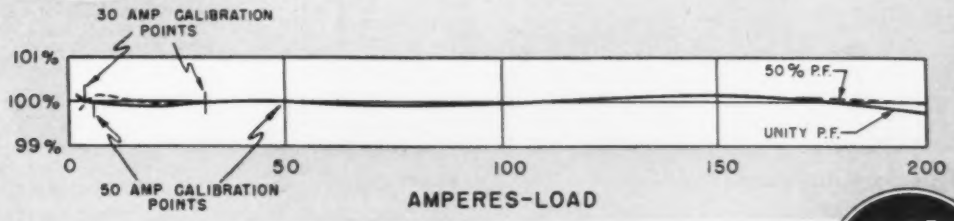
50 AMP.

TYPE MK

The Duncan Type MK Class 200 meter is the latest of the improved singlephase MK line, built to accurately meter a wide range of loads from a few watts to the meter's full 200 ampere capacity. Arc-resistant insulation in the electromagnet, self-contained arc gaps to by-pass electrical disturbances, and Alnico V permanent magnets to maintain calibration stability are just a few of the MK features in this meter.

This meter also offers excellent performance. Note the "straight line" load curves in diagram below. Meters are available with test ampere ratings of both 30 and 50 amperes, starting watts 24 and 36, respectively.

Duncan offers "Meters to Meet Your Requirements", with field engineers and representatives serving all areas of the country. Quick delivery from finished stocks. TRY DUNCAN SERVICE!



DUNCAN ELECTRIC CO., INC., LAFAYETTE, INDIANA

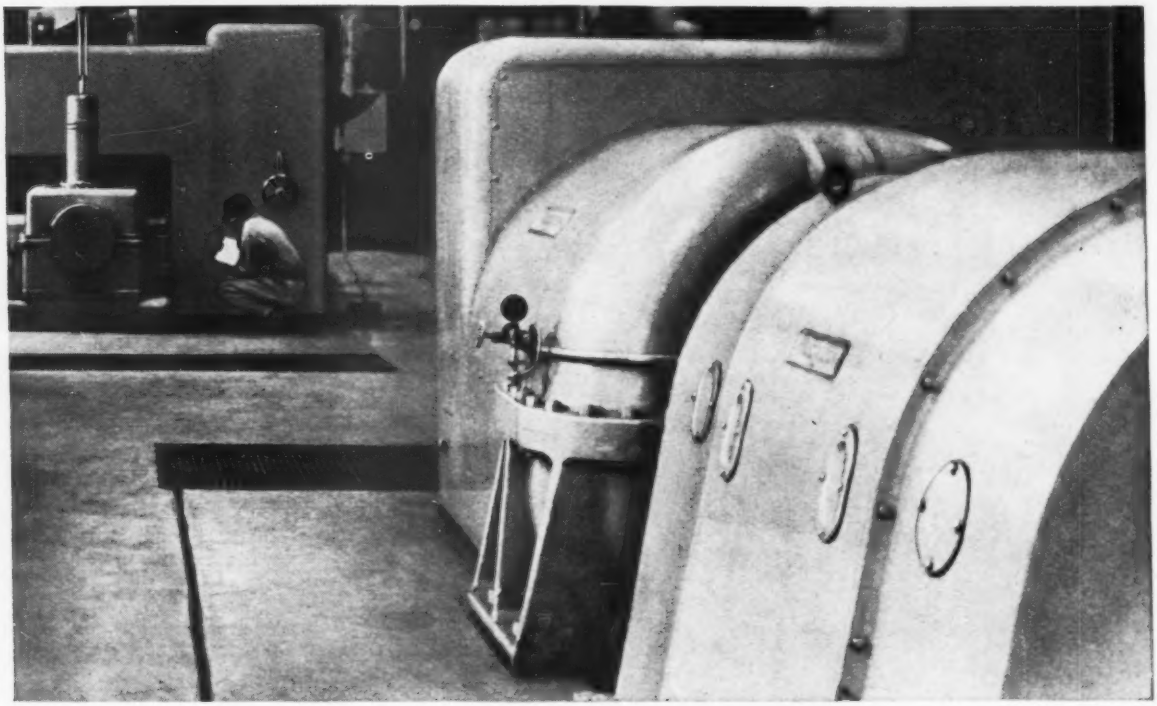
LIVE BETTER ELECTRICALLY WITH FULL HOUSEPOWER

STANDARD ENGINEER'S FIELD REPORT

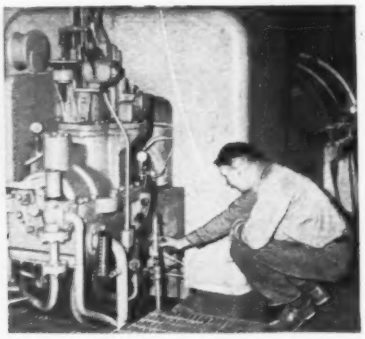
PRODUCT CHEVRON OC TURBINE OIL

FIRM Southern Utah Power Co. Cedar City, Utah

After 70,918 hours, Oil Neutralization No. only .01!

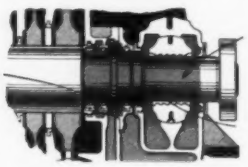


Latest analysis of Chevron OC Turbine Oil in these two Westinghouse steam turbines at Southern Utah Power Co. shows oil to be in virtually new condition. Neutralization number was just .01, and all other characteristics measured were equally satisfactory. At time of sampling, 2,500 KW turbine (in foreground) had run 70,918 hours, 5,000 KW unit (at rear) 31,670 hours. Neither unit has required sweetening since initial charge of Chevron OC Turbine Oil (formerly called Calol OC Turbine Oil).



Steam Plant Superintendent Ralph Jones (left) explains how changes in load automatically control boiler's induced draft fan through this fluid coupling. Chevron OC Turbine Oil has given excellent service as hydraulic fluid in this coupling. At right, Mr. Jones checks oil temperature on smaller turbine. This unit went into service in 1945, the larger one in 1951.

Why Chevron OC Turbine Oil prevents sludging, rusting and wear



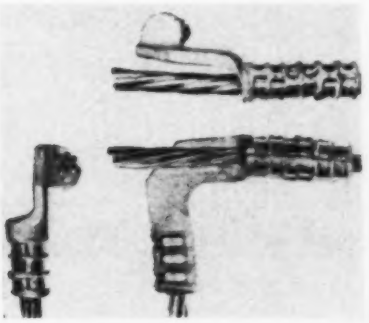
- Excellent metal wetting ability keeps oil on bearings and gears under heaviest loads
- Oxidation inhibitor prevents sludge, gum and lacquer formations
- Corrosion inhibitor prevents rusting

For More Information contact your Standard Engineer or Representative, or write 225 Bush Street, San Francisco 20, California

CHEVRON

TRADEMARKS "CHEVRON" AND CHEVRON DESIGN REG. U.S. PAT. OFF.

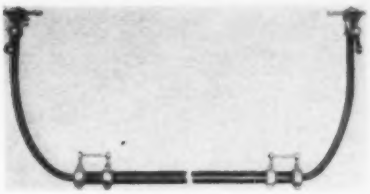
STANDARD OIL COMPANY OF CALIFORNIA



Compression Connector

(22) *Penn-Union Electric Corp., Erie, Pa.*

This new compression connector has the run and tap on opposite sides of the L-bar so that drip from a copper run cannot fall on an aluminum tap wire and cause corrosion. The connector is quickly hooked over the run and crimped by any standard crimping tool. Especially convenient for a tap off a hot run. It is completely marked for conductor accommodations, color-coded at both ends. Said to be usable on all combinations of aluminum to copper, or aluminum to aluminum.



Protected Jumper

(23) *James R. Kearney Corp., 4236 Clayton Ave., St. Louis 10, Mo.*

Greater safety in hot line work and longer cable life is provided by a new jumper with a Fiberglas reinforced sleeve to prevent mechanical damage to the most vulnerable part of the cable insulation. The jumper may be gripped with wire tongs or lashed to the crossarm without abrading the insulation. Accidental electrical contacts while handling are prevented by attaching the clamps to the stirrups. The long rigid section reduces working area congestion by eliminating the usual long cable loop and keeping the jumper within three feet of the conductor. Made in 12-, 14-, 16-ft lengths, with 10,000-v cable terminated in aluminum clamps for use on conductors through 636 mcm ACSR.

ULTRA MODERN CITY HALL CALLS FOR UP-TO-DATE TRANSFORMERS

NEW CITY HALL, SAN JOSE, CALIFORNIA

HILL 1000 KVA Power Transformer was installed. Unit is a 3-phase, 60 cycle, oil filled, self-cooled, class OA, 55°C. 12,000V delta to 480Y/277V with taps.

Proven performance is the result of continuing research and development! HILL's engineers now, as in years past, continue to search out and test new ways to prove their product. Transformers must be "up-to-date" today, to stay in service tomorrow!

Manufactured to NEMA and ASA standards

OIL FILLED • ASKAREL DRY TYPES

HILL

HILL TRANSFORMER CO., INC.
1030 WASHINGTON STREET
SAN CARLOS • CALIFORNIA

Available through leading electrical wholesalers

BULLETINS ETC.

(24) CAPACITOR RACKS — Catalog Bulletin PC4, now available, describes Line Material Industries' single-row, three-row, and cluster-type capacitor rack assemblies. Features, ratings and dimensions are outlined. Information about accessories for these racks is also included. Write to Line Material Industries, Milwaukee 1, Wis.

(25) NEW PRODUCTS — Metaltite Products Inc., 6810 McCook Ave., Hammond, Ind., has published a catalog illustrating and describing eight new items the company is now ready to market. The products are wiring troughs, panel enclosures, pushbutton enclosures, and sectional wireways. All are oil tight.

(26) CONTROL DEVICES — General Electric's General Purpose Control Dept. has published GEC-1260C, a new 88-page publication covering its complete line of control devices. Selection charts and guide form specifications are included. Write to the department at Schenectady 5, N. Y.

(27) ELECTRICAL HOUSINGS — Adalet Mfg. Co., 14300 Lorain Ave., Cleveland 11, Ohio, has combined into a 16-page bulletin (B. 158) selection and specification data for its extensive line of cast-aluminum weatherproof and explosionproof housings.

(28) PRODUCTS LIST — Bristol Co., Waterbury 20, Conn., has published a complete list of all its products, together with a branch office directory, associated companies, officers and department heads, trade names, product classification list, and various other lists and information about the company and its products. Ask for Bulletin W1805.

(29) ELECTRICAL CONNECTORS — The Pyle-National Co. announces the availability of a new 62-page catalog on its new "Pyle-Star-Line" compact, environment-resistant connectors. Detailed specifications and selection data are given. Write to the company at 1334 N. Kostner Ave., Chicago 51, Ill.

(30) ELECTRIC HEAT MANUAL—A new manual for planning electric heating systems is offered by Markel Electric Products Inc. and LaSalle Products Inc., Buffalo, N. Y. It is said to feature a new, easier method of computing heat losses.

(31) DISTRIBUTION EQUIPMENT — Murray Mfg. Corp. announces its new 1958 catalog of electrical distribution equipment. It is a 72-page, digest-type catalog and gives complete product and ordering information on safety switches, fusible service, circuit breakers, load centers and meter mounting equipment. Address is 1250 Atlantic Ave., Brooklyn 16, N. Y.

(32) OUTDOOR LIGHTING — How electric utilities can cash in on the vast load-building potential of outdoor home lighting is the message of a new "How-To Book of Outdoor Lighting Promotion," available from General Electric Large Lamp Dept. Write to the department at Nela Park, Cleveland 12, Ohio.

(33) POWER CABLES — A new 4-page technical bulletin describing neoprene-sheathed high-voltage power cables for 3- to 15-kv service is now available from Rome Cable Corp. Address requests to Publications Division, Rome Cable Corp., Rome, N. Y. Ask for Bulletin RCD-701.

KILL TWO BIRDS WITH ONE STONE—Fill out this coupon and get back valuable information from as many sources as you indicate.

ELECTRICAL WEST
68 Post St., San Francisco 4, Calif.

Not good after June 1

Please send me, without obligation, the new product information or catalogs:

If described in Product News, circle item number

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33

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NAME ..... TITLE .....

COMPANY .....

ADDRESS .....

CITY ..... ZONE ..... STATE .....

*Please include your company's name and your position, as we cannot ask manufacturers to furnish literature unless you do.

Here are the 22 Graybar Offices in the West

FOR IMMEDIATE SERVICE ON EVERYTHING ELECTRICAL CALL THE OFFICE NEAREST YOU

ARIZONA	
Phoenix:	1700 North 22nd Ave. ALPINE 2-2371
Tucson:	212 South Park Ave. TUCSON 2-6439
CALIFORNIA	
Fresno:	101 Van Ness Ave. ADAMS 7-4175
Long Beach:	800 West 16th St. HEMLOCK 2-2911
Los Angeles:	210 Anderson St. ANGELUS 3-7282
Oakland:	1911 Union St. GLENCOURT 1-5451
Sacramento:	1900 — 14th St. GILBERT 2-8976
San Bernardino:	655 South "H" St. TURNER 9-1051
San Diego:	720 State St. BELMONT 3-1361
San Francisco:	1750 Alameda St. MARKET 1-5131
Santa Ana:	301 French St. KIMBERLY 3-8309
Van Nuys:	15520 Cabrito Road
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Colorado Springs:	630 West Vermijo Ave. MELROSE 4-3701
Denver:	104 Wazee Market TABOR 5-7111
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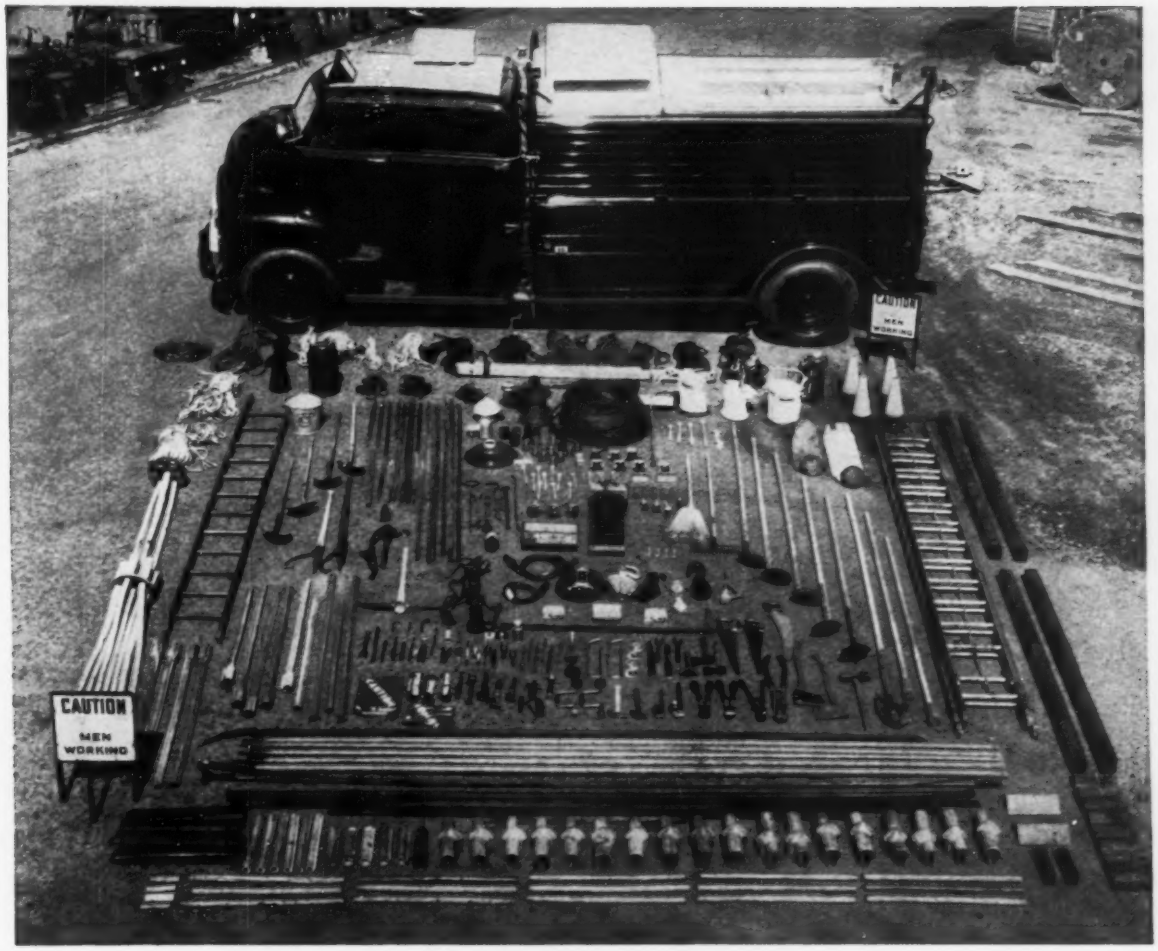
Boise:	1325 Idaho St. BOISE 2-4501
MONTANA	
Butte:	604 E. Aluminum St. BUTTE 3222
OREGON	
Eugene:	2580 West Broadway DIAMOND 4-2224
Portland:	Park & Flanders Sts. CAPITOL 7-6641
UTAH	
Salt Lake City:	2336 North Third West St. ELGIN 9-8771
WASHINGTON	
Seattle:	King & Occidental Sts. MUTUAL 0123
Spokane:	West 1033 Gardner Ave. FAIRFAX 7-6611
Tacoma:	2112 "A" St. MARKET 0164

Call Graybar *first* for . . .

Everything Electrical GraybaR

IN OVER 130 PRINCIPAL CITIES



Look at your line truck equipment needs from this angle . . .

Here's a poles-eye view of a typical utility line truck showing the wide variety of construction and maintenance tools and safety equipment your linesmen need for most day-to-day jobs. But—without exception—each and every item shown can be ordered conveniently from your nearby Graybar office or warehouse...and in every case you get the type and quality needed to assure speed and efficiency on the job *plus* long years of satisfactory service. All are products your linesmen know and respect—products that have been tried, tested and proven in the field by scores of companies just like your own.

Remember, when you order "via Graybar", you save the time and expense of multiple inquiries, for you can select, from this single source, the items best suited to your needs from among the products of over 200 of the nation's leading manufacturers.

Graybar is thoroughly familiar with utility requirements. Further, your nearby Graybar Representative stands ready to help as a convenient source of information on everything needed for pole-line construction and maintenance. And should you be faced with an out-of-the-ordinary problem, call on the experience of a Graybar Outside Construction Specialist for a consultation. We'll welcome your inquiry!

511

CALL GRAYBAR FIRST FOR...

Graybar Everything Electrical

GraybaR ELECTRIC CO., INC.
420 Lexington Ave., New York 17, N. Y

IN OVER 130 PRINCIPAL CITIES

Orders for DRIVER-HARRIS Nickel and Nickel Alloy Wire FILLED IN 24 HOURS

If we receive your order in the morning, it will be shipped out before evening . . . this is the new service policy of Driver-Harris in the manufacture and distribution of 18 most frequently purchased Nickel and Nickel Alloys in wire form. In addition to this new warehouse stocking program, is the improved delivery schedule for Monel, Grade "A" Nickel, Inconel, R Monel and some Stainless Steels with lead time reduced to only 7 days in certain cases. The following list covers immediate availabilities. For complete detailed current listing showing all sizes and specifications, contact the nearest Driver-Harris branch — or call HUmboldt 3-4800 (New Jersey), REctor 2-9579, 80, 81, 82 (New York City).

IN STOCK READY FOR DELIVERY

MONEL	25 wire sizes from .0021 to .091
GRADE "A" NICKEL	12 wire sizes from .0025 to .091
GRADE "D" NICKEL	9 wire sizes from .005 to .015
INCONEL	3 wire sizes from .0253 to .050
STAINLESS STEEL	
Type 304	24 wire sizes from .0016 to .164
Type 316	6 wire sizes from .007 to .0135
Type 330	25 wire sizes from .0063 to .144
NICHROME*	65 wire sizes from .0007 to .289
NICHROME* V	62 wire sizes from .00045 to .289
CHROMAX*	35 wire sizes from .0031 to .258
KARMA*	36 wire sizes from .0005 to .036
ADVANCE*	49 wire sizes from .0008 to .258
MANGANIN	37 wire sizes from .001 to .1285
LOHM*	29 wire sizes from .001 to .182
MIDOHM*	28 wire sizes from .00175 to .182
30 ALLOY	28 wire sizes from .0015 to .182

LEAD TIME FOR MANUFACTURING WIRE & RIBBON

As low as 10 days for

COLD DRAWN MONEL	wire sizes from .001 to .1875
GRADE "A" NICKEL	wire sizes from .001 to .1875
COLD DRAWN INCONEL	wire sizes from .001 to .1875
R MONEL	wire sizes from .0285 to .204

As low as 7 days for

STAINLESS STEEL wire and ribbon
Types: T-302, T-304, T-305, T-316, T-430, T-446

*TM. REG. U.S. PAT. OFF.
INCONEL & MONEL
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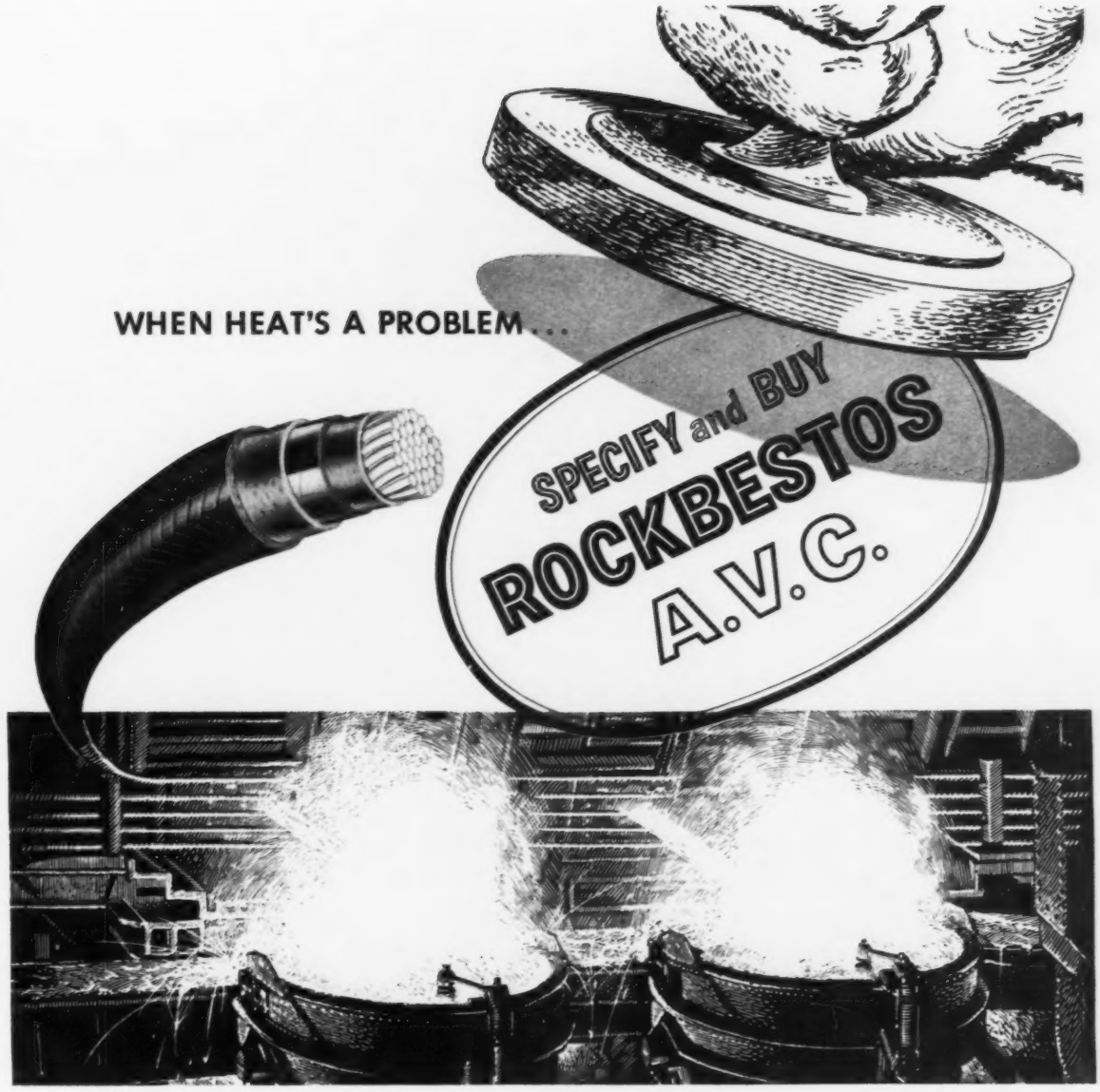
INTERNATIONAL NICKEL
COMPANY INCORPORATED

Driver-Harris Company*

HARRISON, NEW JERSEY

Distributor: ANGUS CAMPBELL, INC. • 4417 S. Soto St., Los Angeles 58 • 760 Tennessee St., San Francisco 7

MAKERS OF THE MOST COMPLETE LINE OF ALLOYS FOR THE ELECTRICAL, ELECTRONIC, AND HEAT-TREATING INDUSTRIES



Steel Mill and Foundry "hot spots" provide one of industry's worst torture chambers for wire and cable. Heat, overloads and corrosive fumes combine to kill ordinary cable quickly.

Don't take a chance on ordinary cable for troublesome "hot spot" applications. *Specify and use Rockbestos A.V.C.*

This superior AVA cable, with asbestos, varnished cambric insulation, takes temperatures up to 230°F, assuring continuous operation in hot spot applications, provides greater current carrying capacity for increased and new loads.

When you *specify and buy Rockbestos A.V.C.*, you reduce your electrical maintenance and construction costs . . . you get years more dependable service.

Write now for the new Rockbestos RSS-88 to help you *specify and buy Rockbestos A.V.C.*

ROCKBESTOS PRODUCTS CORPORATION
NEW HAVEN 4, CONNECTICUT

NEW YORK • CLEVELAND • DETROIT • CHICAGO • OAKLAND
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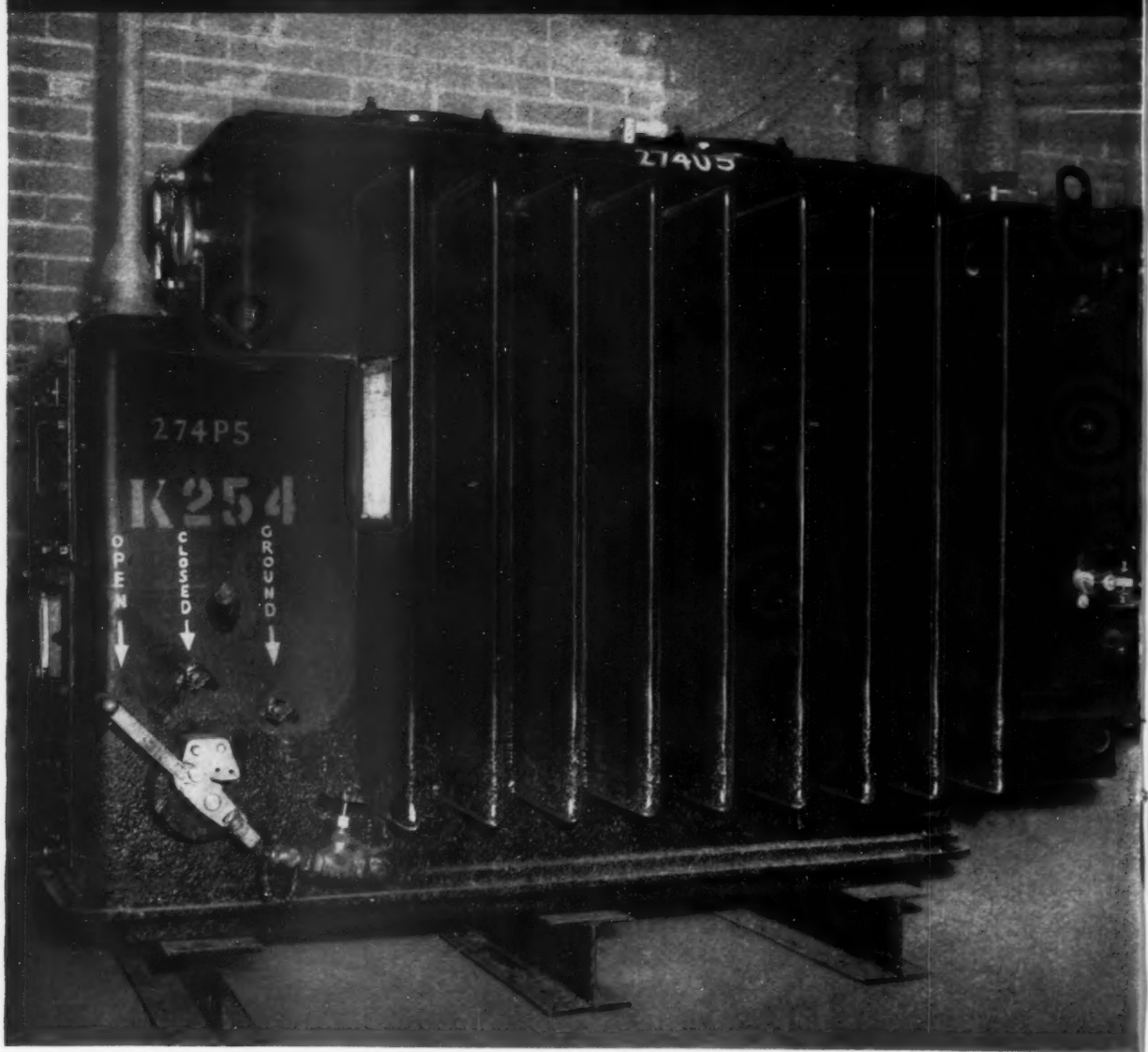
ROCKBESTOS A.V.C.

THE SUPERIOR A.V.A. CABLE

Cut network costs three ways . . .

SPACE-MISER NETWORK ON ORIGINAL COST, MAINTENANCE



TRANSFORMERS SAVE INSTALLATION AND

Mr. J. C. Gardner, Westinghouse network transformer representative at the Sharon, Pa., plant, illustrates the relative size of the outstanding SPACE-MISER.

Along with other leading utilities, New York State Electric & Gas Corporation has been quick to recognize the cost-cutting advantages of the SPACE-MISER transformer in their network operations. The SPACE-MISER offers a big three-way saving—whether for original or replacement installation . . . here's how:

Standard design saves on original cost. The SPACE-MISER meets all EEI-NEMA Standards and most customer requirements without modifications. There are no expensive "extras" normally required.

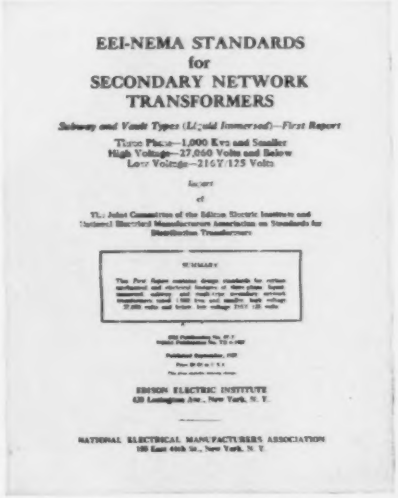
20% size and weight reduction cuts installation cost. New vaults can be built smaller. Existing transformers can be replaced with higher rating SPACE-MISERS, without vault alterations. Installation is faster, easier—handling safer.

New tank and coolers cut maintenance. The contoured tank and Yukon coolers provide smooth surfaces that readily shed corrosive materials. Streamlined design eliminates sharp edges where corrosion starts. Greater clearances between coolers provide easy accessibility for inspection, cleaning or repainting.

The all-important overload ability and long life required for network use have been fully retained, while providing these new advantages found only in SPACE-MISER.

Call your Westinghouse representative for the complete story of the SPACE-MISER . . . another development made possible through Plowback of Earnings into research. Or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa. J-70871

Inside a network vault of New York State Electric & Gas Corp., Binghamton, N.Y.: another SPACE-MISER transformer installed by a customer who recognizes the advantages inherent in the SPACE-MISER design.



EEI-NEMA STANDARDS
for
SECONDARY NETWORK
TRANSFORMERS

Subway and Vault Types (Liquid Immersed)—First Report

Three Phase—1,000 Kva and Smaller
High Voltage—27,060 Volts and Below
Low Voltage—216Y/125 Volts

Issued
by
The Joint Committee of the Edison Electric Institute and National Electrical Manufacturers Association on Standards for Distribution Transformers

SUMMARY

EDISON ELECTRIC INSTITUTE
NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION

New EEI-NEMA Standards result in savings to the user of network transformers. Westinghouse was active in the leadership to promote these standards.

YOU CAN BE SURE...IF IT'S Westinghouse

"I'm Glad They Thought of Me"

SPRING-CONTROLLED KEEPER IN NEW O-B CLAMP MAKES LINEMAN'S JOB EASIER

The new O-B 88500 Universal Clamp was obviously designed with the convenience of the lineman foremost in mind.

The clamp stays open automatically while he does the forming and bending of the conductor . . . held open by a special spring clip. He doesn't have to fumble with loose nuts, bolts, washers or keeper pieces since there is no need to remove them at any time. Installation can be made entirely from one side of the clamp. It can be worked with the line hot or dead.

Made of malleable iron, taking conductors between .20 and .50 inches in diameter, this new clamp offers an obvious way to make the lineman's job easier.

Besides keeping the lineman happy, use of this new 88500 clamp is the sure way to faster, more efficient deadending on your distribution lines.

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass

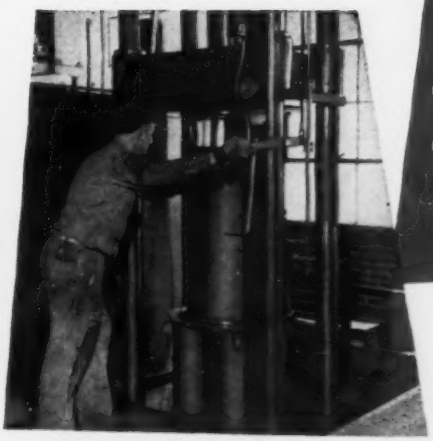
Special spring holds keeper open.

Distributed by GraybaR ELECTRIC COMPANY

4860-H

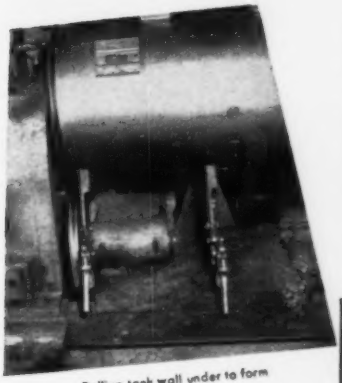
TOUGH TANKS...

Seams being mash-resistance welded.

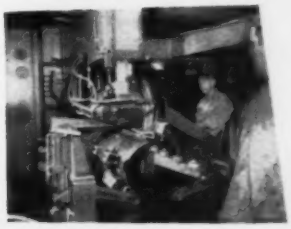


Seating base and forming top rim.

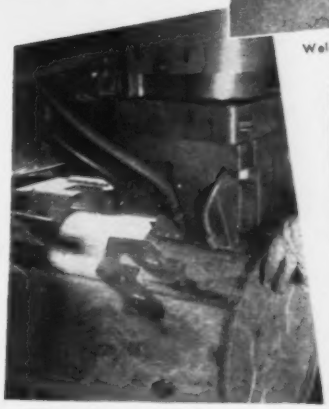
Welding tank base to the shell.



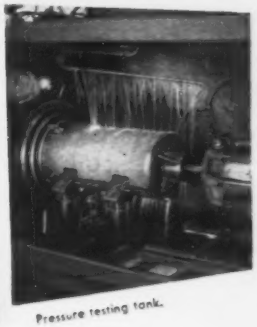
Rolling tank wall under to form triple thickness at base.



Automatic positioning resistance welder welding fins to tank.



Welding fixtures to tank wall.



Pressure testing tank.

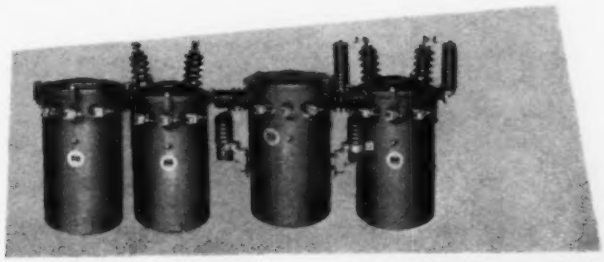
PROTECT MOLONEY TRANSFORMERS

The quality and performance of Moloney Transformers is protected by tanks rugged enough to keep oil in and weather out . . . under all conditions.

Moloney tanks of copper-bearing steel with mash-resistance welded seams are built tough to take it. To provide triple thickness of metal at the bottom of the tank, the bottoms are seated, welded, rolled under and sealed against moisture with a special mastic. Each tank is pressure-tested for leaks before painting. Tanks move along the assembly line on pallets to eliminate possible damage to the finish. Retained gaskets are provided on Moloney Distribution Transformers and after assembly and automatic testing, every transformer is "tilt-tested" for gasket leaks.

Tough tanks . . . another reason for specifying Moloney wherever transformers must perform dependably under all operating conditions.

For Quality and Dependability . . . All along the line . . . contact your nearest Moloney representative.



Moloney Distribution Transformers conform to EEI-NEMA standards and are available in all standard ratings and types.

MEES-6

MOLONEY ELECTRIC COMPANY

Manufacturers of Transformers for Utilities, Industry, and Electronic Applications

FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA

new Copperweld

type M guy strand . . .

the key to lower costs

Copperweld* Type M Guy Strand offers double economy: 1. lower first cost, 2. lower maintenance costs. Research and new production techniques make it possible for us to manufacture Type M at savings which are passed on to you. The result is Copperweld quality costing you less than before. And the savings don't end after installation. They continue year after year because Type M Guy Strand requires so little maintenance. It will last as long as modern poles.

Seven strengths are available: 2.2M, 4M, 6M, 8M, 10M, 12.5M and 16M. Easy to handle—easy to install, Type M Guy Strand can be readily bent, served, moused or clamped. Write us today for complete information about this new product and its money-saving features.

*Trade Mark

COPPERWELD STEEL COMPANY

WIRE AND CABLE DIVISION *Glassport, Pa.*

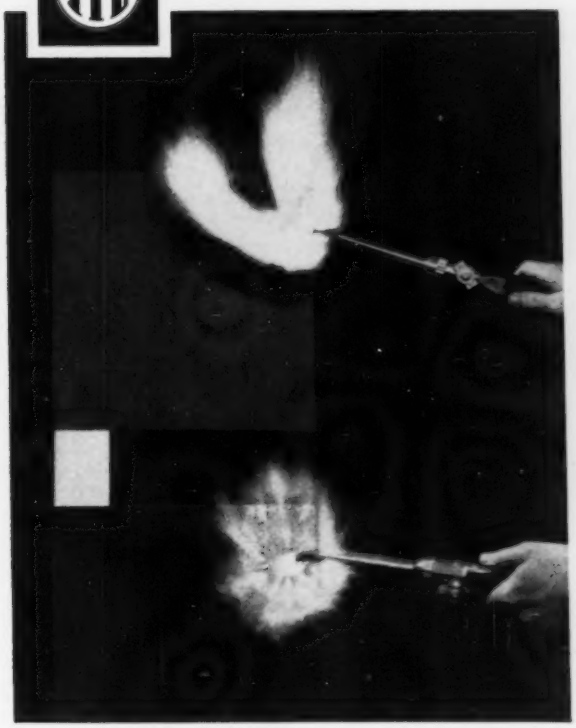
For Export: COPPERWELD STEEL INTERNATIONAL COMPANY, New York

New Copperweld TRADE MARK

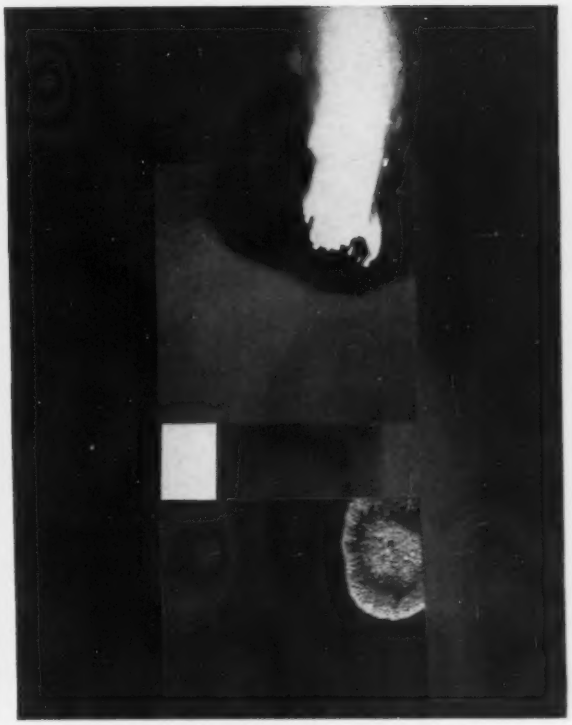
TYPE M GUY STRAND

2.2M 4M 6M 8M 10M 12.5M 16M

METAL-CLAD SWITCHGEAR



TORCHES IGNITE FLAMETRAP (bottom) and conventional insulation (top) simultaneously.



SECONDS LATER, FLAMETRAP has snuffed out, but conventional insulation still burns briskly.

New FLAMETRAP Insulation Snuffs Out Flame ...No Toxic Gases...Highest Arc Resistance

FLAMETRAP INTERPHASE BARRIER. Standard equipment on I-T-E 5 and 15 kv switchgear at no increase in price.

Take the heat away, and this new I-T-E developed FLAMETRAP insulation snuffs out . . . fast! This is today's most advanced flame-retardant insulation, and it is used exclusively in I-T-E Switchgear.

FLAMETRAP contains melamine resin—heretofore considered too expensive for commercial application. Unlike substitute ingredients, melamine gives off no toxic gases when it burns. So FLAMETRAP is far safer. And melamine stands up better under high temperatures. So FLAMETRAP suffers less from arc damage.

This latest improvement puts I-T-E switchgear even further ahead of the pack. It is one more of the quality details that keep coming your way from I-T-E without increase in price.

I-T-E service is as near as your telephone or mailbox. Why not call or write today. I-T-E Circuit Breaker Company, Switchgear Division, 19th & Hamilton Sts., Philadelphia 30, Pa. In Canada, Eastern Power Devices Ltd., Port Credit, Ont.

I-T-E CIRCUIT BREAKER COMPANY
PHILADELPHIA, PENNSYLVANIA

Along today's modern highways easy-to-handle J-M Transite Ducts provide installation economies and years of service life, protecting traffic-signal, lighting, and other power-service circuits.

J-M Transite® Ducts install fast to last... give complete cable protection.

Because speed and economy set the pace in today's highway programs, more and more highway cables are going into Johns-Manville Transite Ducts.

For speed, Johns-Manville Transite Ducts are strong, light and long—easy to handle and install. Workmen set 10-foot lengths in place easily, join them up tight in seconds with snug-fitting J-M Plastic Couplings, and Transite's smooth bore is free of burrs and other obstructions that may interfere or cause damage during pulling of cables.

For economy, J-M asbestos-cement Transite Ducts go in to stay. Non-conductive Transite is not affected by electrolysis—resists the corrosive action of fills or high-salt soils in permanently damp locations. Millions of feet of installed Transite Ducts have proved that Transite withstands earth loads and soil stress . . . resists vibration and shock from highway traffic.

Let us send you free Transite Duct brochure EL-29A. Write Johns-Manville, Box 14, New York 16, N. Y. In Canada, Port Credit, Ontario.

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville Asbestos Transite Ducts can be laid directly in trench without concrete envelope or other mechanical protection.

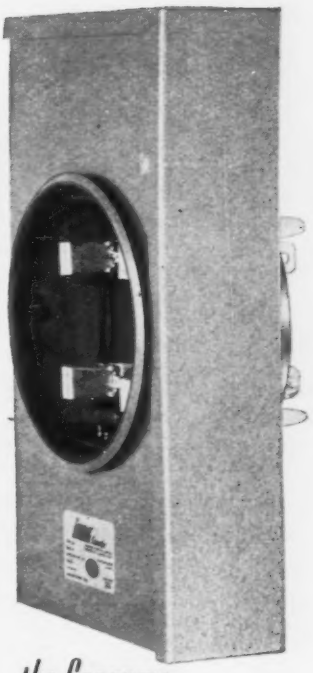
JOHNS-MANVILLE Transite Ducts

Made of Asbestos-Cement

J-M Conduit for direct buried banks and exposed runs
J-M Korduct® for concrete banks

NEW... 2 kvar SECONDARY CAPACITOR

provides low cost vars at point of *greatest system benefit*



Here's the answer to utilities looking for a more economical 240 volt secondary power capacitor. The Sangamo Secovar Capacitor installs right at the meter box to relieve the var load all down the line, to cut installation costs, and to conserve valuable pole space.

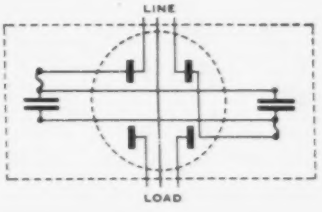
Installation is simple. No wiring changes are necessary. No special equipment is needed . . . one man can make the installation in a matter of minutes.

the Sangamo **Secovar Capacitor**

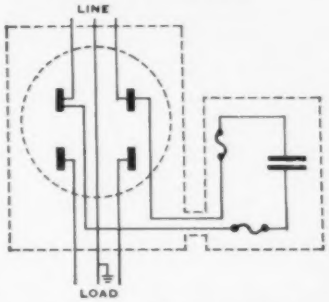
TYPE S for socket mounting

Combines a secondary power capacitor with a convenient socket mounting adapter. Mounts on a standard meter base—either vertically or horizontally. It contains two capacitor sections, each protected against line or ground faults. Available in 2 kvar, 240 volt rating.

WIRING DIAGRAM



WIRING DIAGRAM



TYPE N for adjacent mounting

Comes in a metal enclosure with an adjustable mounting bracket and a nipple connection for installation with standard indoor or outdoor service entrance equipment. Protected against either line or ground faults. Available in 1 kvar, 240 volt rating.

PC58-2

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

Con Edison increases capacity with Tiger Brand Paper-Lead Cable

LIKE most utilities, Consolidated Edison, New York City, is rapidly expanding in an endless race to keep up with growing demand for electrical power.

The problem of old and new comes into sharp focus in the Williamsburg section of Brooklyn. It's one of the earliest settled areas of the city. Many of the houses were not designed for any electricity—let alone for refrigerators, freezers, air conditioners, automatic heating systems and do-it-yourself power tools.

The installation of the Brooklyn-Queens Expressway—a new Belt road that sliced through the heart of Williamsburg, got in the way of existing electrical conduits and relocated some Con Edison customers. Now, the utility is re-routing with new lines to avoid the expressway.

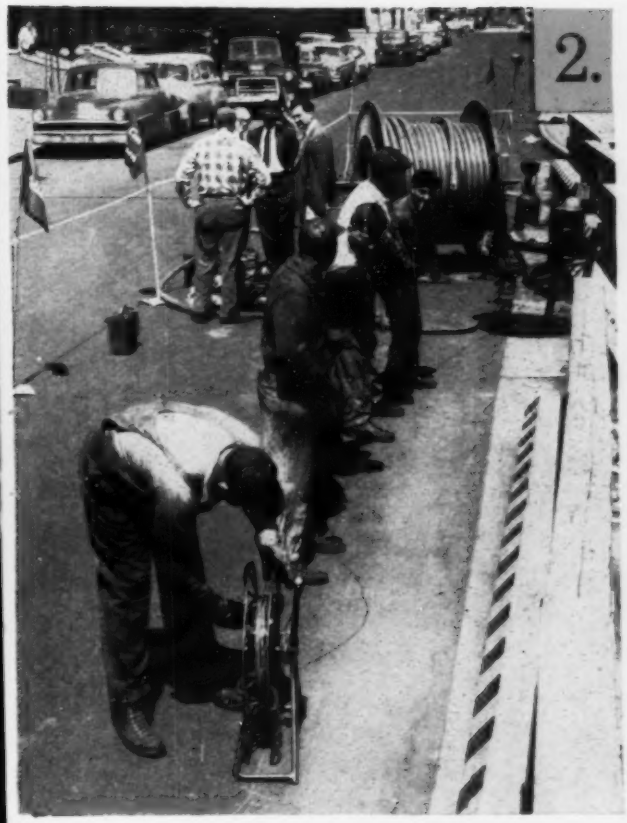
The over-all job is a massive one, and the cable is supplied by several reputable manufacturers including American Steel & Wire. In the district shown in the photographs, AS&W shipped some 12,000 feet of 2/0, 27KV, 3-conductor, paper-insulated lead-sheathed Tiger Brand cable in carefully predetermined lengths.

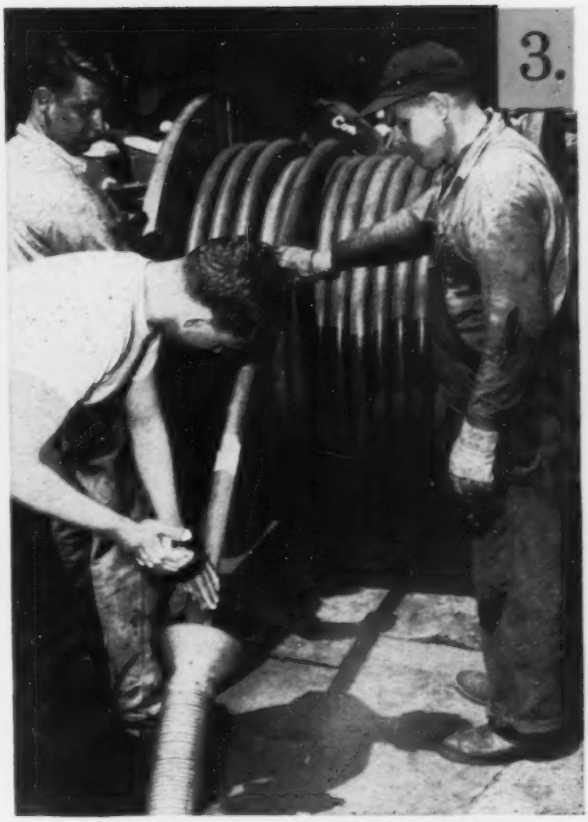
For high voltage feeders, Tiger Brand Paper Insulated Cable is available in solid or gas pressure types. Many special constructions are available as standard production. An inquiry detailing your requirements will receive our prompt and careful attention.

AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL, GENERAL OFFICES: CLEVELAND, OHIO

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors

Tennessee Coal & Iron Division, Fairfield, Ala., Southern Distributors • United States Steel Export Company, New York



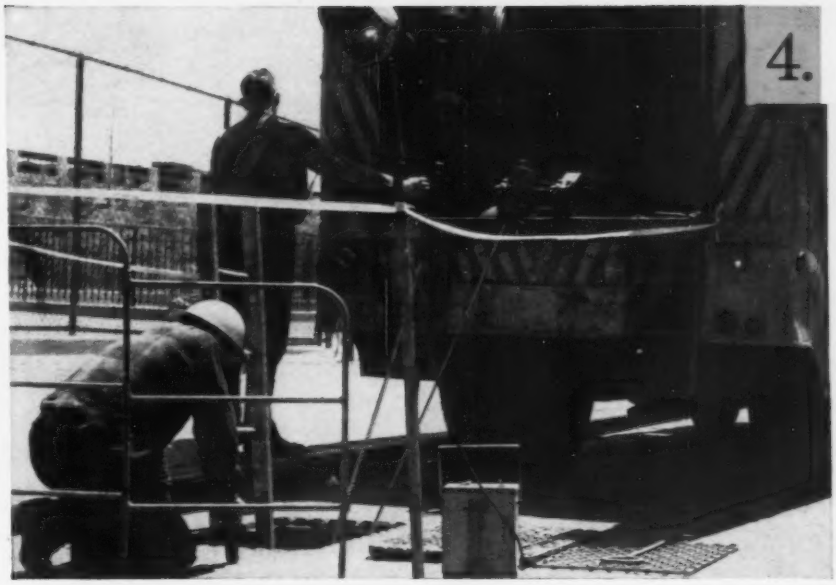


1. Reels are lowered onto street from winch truck, while workmen clean the 4-inch prefab concrete ducts.

2. Crew pulls the steel wire brushes through ducts to remove pebbles and dirt. Pull here is 393 feet.

3. Cable is heavily lubricated with special pulling compound before it goes into the baloney.

4. Winch truck begins pull, maintaining a 20-foot-per-minute rate.



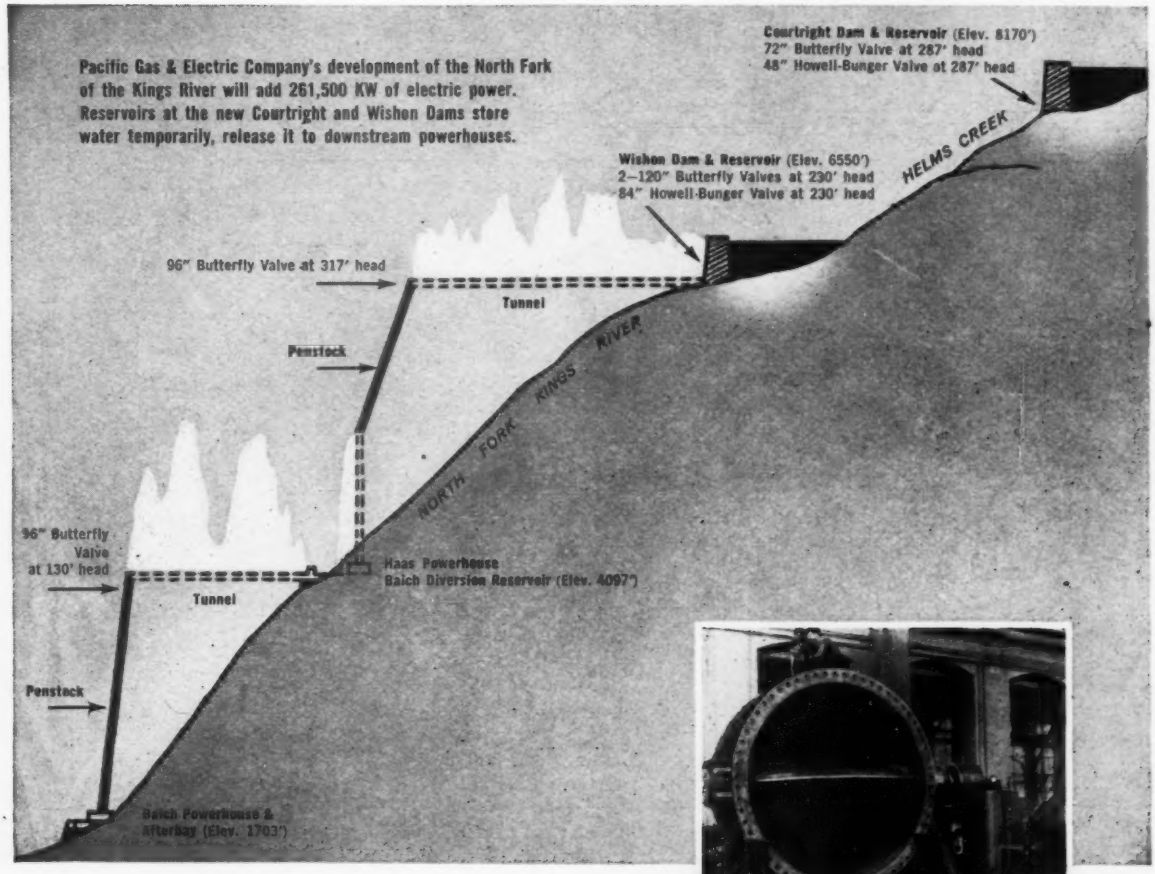
USS TIGER BRAND ELECTRICAL WIRE & CABLE

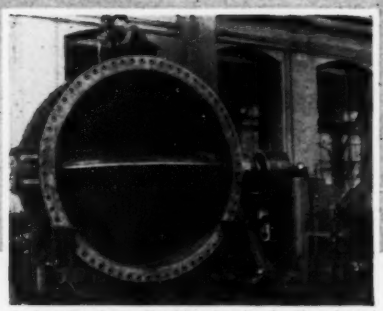
a standard Tiger Brand Cable for every special job

- Asbestos Wire and Cable
- Mold Cured Portable Cord
- Shovel & Dredge Cable
- Paper & Lead Cable
- Varnished Cambric Cable
- Interlocked Armor Cable
- Special Purpose Wire & Cable
- Aerial, Underground and Submarine Cable

UNITED STATES STEEL

USS TRADEMARK


Pacific Gas & Electric Company's development of the North Fork of the Kings River will add 261,500 KW of electric power. Reservoirs at the new Courtright and Wishon Dams store water temporarily, release it to downstream powerhouses.
Courtright Dam & Reservoir (Elev. 8170')
72" Butterfly Valve at 287' head
48" Howell-Bunger Valve at 287' head
HELMS CREEK
Wishon Dam & Reservoir (Elev. 6550')
2—120" Butterfly Valves at 230' head
84" Howell-Bunger Valve at 230' head
96" Butterfly Valve at 317' head
Tunnel
Penstock
NORTH FORK KINGS RIVER
96" Butterfly Valve at 130' head
Tunnel
Haas Powerhouse
Baich Diversion Reservoir (Elev. 4097')
Penstock
Baich Powerhouse & Afterbay (Elev. 1703')



During shop tests, the 96-inch valve for Haas tunnel demonstrates the streamlined construction of SMS welded steel plate discs. This reduces head loss and turbulence to a minimum.

Kings River Project installs SMS valves

Five SMS Butterfly Valves and two SMS Howell-Bunger Valves are being installed by Pacific Gas & Electric Company on its Kings River hydropower project in the Sierra and Sequoia National Forests. They will control the flow of water from upstream reservoirs to the powerhouses in this $80 million system.

Seals on SMS Butterfly Valves cut leakage to a minimum. Disc and body seals are adjustable from either inside or outside, as specified. Specially-developed SMS trunnion seals are essentially drop-tight. Welded discs and housings assure freedom from the defects of cast materials, and permit more economical construction.

SMS Butterfly Valves have been designed and built in diameters up to 18 feet, and for service with operating heads up to 750 feet. To obtain information on SMS hydraulic turbines, valves and other accessories, write to S. Morgan Smith Company, York, Penna.

One of the 120-inch Wishon Reservoir valves on the SMS assembly floor shows adjustable seals on the discs and recess for the renewable seal ring within the body.

S. MORGAN SMITH HYDRODYNAMICS More Power To . . .

AFFILIATE: S. MORGAN SMITH, CANADA, LIMITED, TORONTO

Rotovalves • Ball Valves • R-S Butterfly Valves • Free-Discharge Valves • Liquid Heaters • Pumps • Hydraulic Turbines & Accessories

SLIPKNOT PLASTIC TAPE

solves the problem

there's waste and extra work in trying to tear plastic tape . . .
but not when you use the exclusive new SLIPKNOT Cutter, packed free*
SLIPKNOT
PLASTIC ELECTRICAL TAPE
with every 66' roll of new SLIPKNOT #7 Plastic Electrical Tape
Try it today.

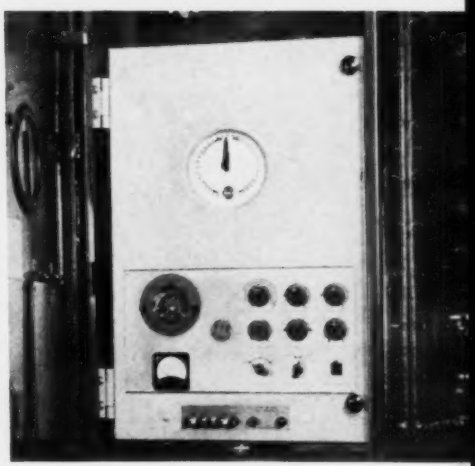
*LIMITED TIME OFFER PAT. PENDING

SOLD ONLY THRU RECOGNIZED WHOLESALERS

PLYMOUTH RUBBER COMPANY, INC.

DIVISION 14 — Makers of SLIPKNOT FRICTION TAPE — CANTON, MASSACHUSETTS

New Static Relay makes...



NEW SIMPLIFIED CONTROL is easy to get to, allows quick inspection. Locking knobs hold settings securely.

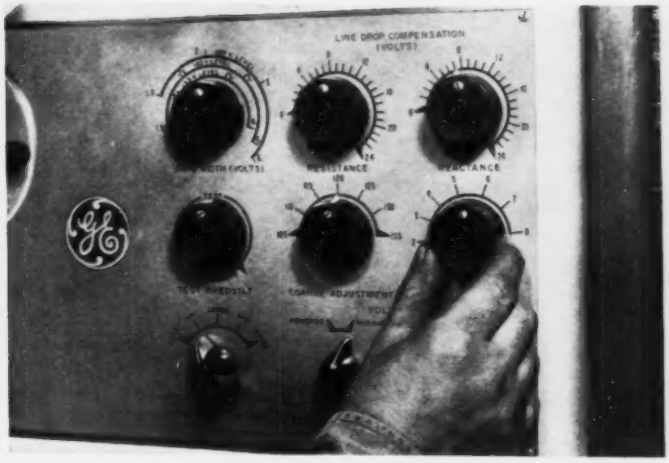
New Static Relay eliminates VRR contacts... permits fast and accurate dialing of bandwidth and voltage level settings . . . now available at no extra cost as optional feature on G-E MLT-32 three-phase regulators rated 1000 kva and below.

The new Static Relay on General Electric's MLT-32 three-phase station regulator performs the function of a voltage-regulating relay . . . but there are no contacts to maintain or replace! Along with this reduction in maintenance, the new relay permits *fast* and *accurate* setting (on an easy-to-read calibrated dial) of bandwidths from $\pm\frac{3}{4}$ to ± 3 volts at all voltage levels from 105 to 135 volts. No more need for a reference voltmeter!

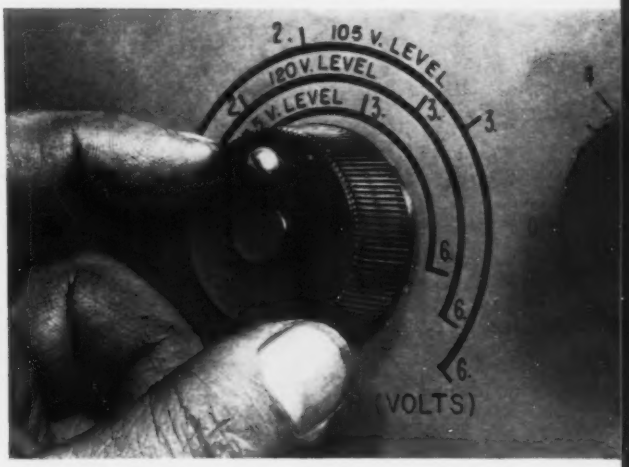
The new Static Relay maintains Class-1 accuracy and all other features of the present control.

This optional feature is available at *no extra cost* on General Electric MLT-32 three-phase station regulators rated 1000 kva and below. You'll want to know more about the MLT-32 and the new Static Relay; write to General Electric Company, Section 423-26, Schenectady, New York, or contact your General Electric Apparatus Sales Office.

General Electric Regulators Cost Less On The Line



DIAL VOLTAGE LEVEL without having to check with a reference voltmeter. Accurately calibrated voltage levels clearly marked for fast, positive settings.



DIAL BANDWIDTH (from ± 3 volts down to $\pm 3/4$ volt). Accurately calibrated scale eliminates guesswork, shortens adjustment time to seconds.

Progress Is Our Most Important Product

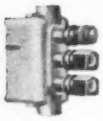
GENERAL ELECTRIC

. . . instantly signaled by Crouse-Hinds *Visularms*®

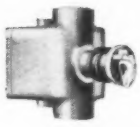
Condulet Visularms

Condulet Horns, Bells & Sirens

Condulet Pilot Lights


Condulet Pushbutton Stations

Condulet Instrument Housings


Condulet Selector Switches

*Dust-ignition-proof.

In oil refineries, chemical plants, synthetic rubber plants — wherever constant watch of processing is necessary — Crouse-Hinds Condulet® *Visularms* provide visual indication of process conditions, and instant control of manufacturing equipment.

By means of pilot lights (and bell, horn or siren signals where desired) *Visularm* indicates normal or abnormal temperature, liquid level, pressure, or other conditions which can be electrically coupled to the circuit.

Explosion-proof or dust-tight and weather-resistant construction* assures maximum safety in hazardous locations. Compact designs minimize space required on control or panel boards . . . are easy to install.

A Visularm system delivers substantial savings by eliminating the necessity for buying individual components . . . housing them . . . and wiring your own system completely.

Two- or three-light styles may be mounted either vertically or horizontally. For audio warning, any number of *Visularms* may be used to operate a single horn, bell or siren.

Visularms are just one of hundreds of items in process control board equipment offered by Crouse-Hinds. Only a few are shown at left. For full information on the complete line, call your nearest Crouse-Hinds distributor, or write . . .

A NATIONWIDE DISTRIBUTION exclusively through ELECTRICAL DISTRIBUTORS

CROUSE-HINDS COMPANY

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if *you have a cable problem...*

—and want Kerite insulation for a special application or unusual condition, you have only to lift the phone. Kerite specialists can show you cables for a wide variety of end uses and conditions.

Each combines Kerite insulation with outer coverings of the most advanced material and engineering. Each provides maximum service reliability and economy. And each has been *proved* on actual jobs.

As cable experts will confirm, no other cable can match this record of performance. We believe you will be impressed by the evidence.

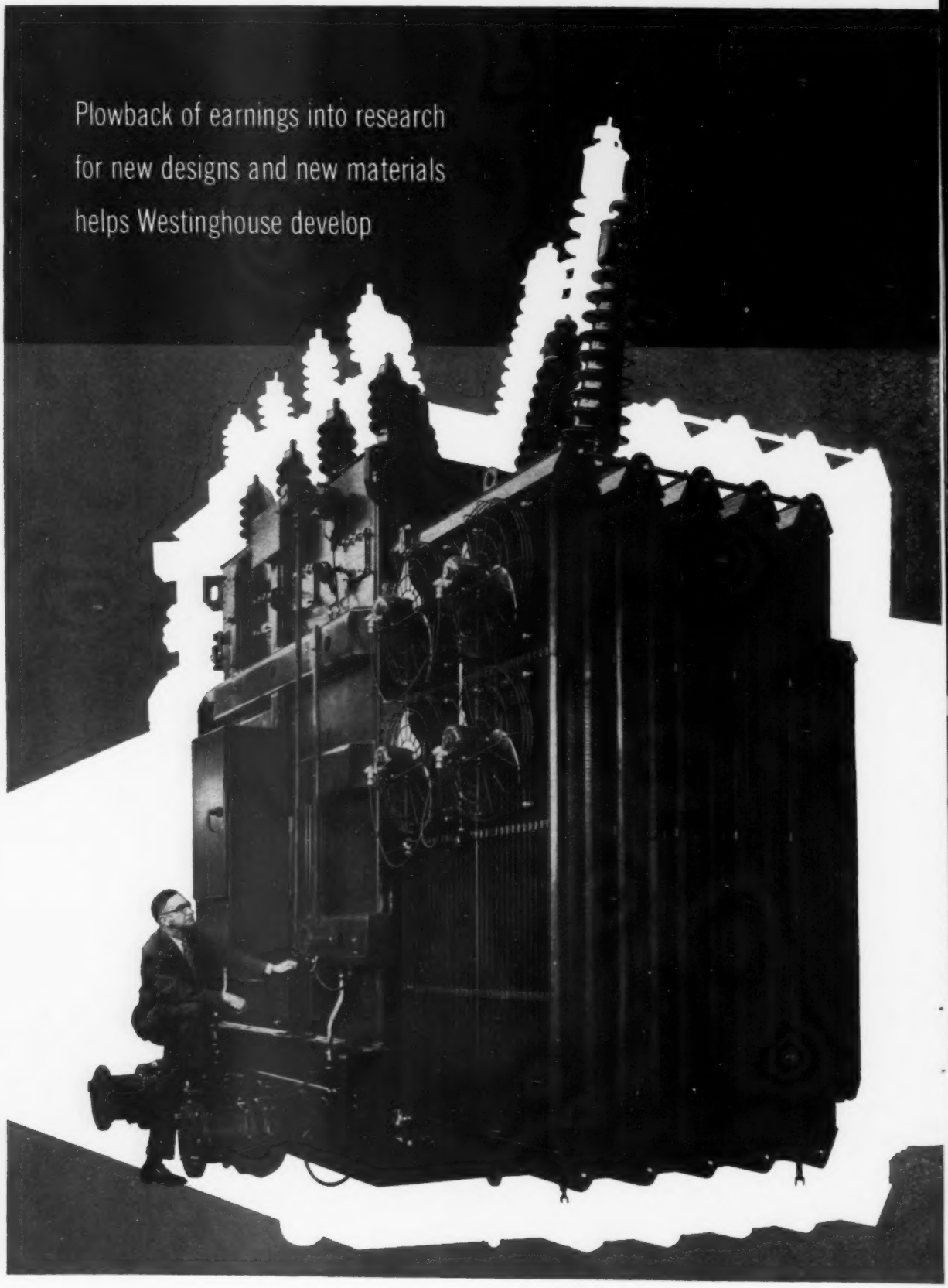
Our headquarters is at 30 Church St., New York 7. Branches are in Ardmore, Pa., Boston, Cleveland, Chicago, Houston, San Francisco, Glendale, Cal.

KERITE CABLE

it's the KERITE *that makes the difference*

DEDICATED TO PROGRESS P I MEMBER

Plowback of earnings into research
for new designs and new materials
helps Westinghouse develop



THE THIRD MAJOR BREAKTHROUGH... NEW INNER-COOLED CONSTRUCTION CRASHES SIZE BARRIER, PAVES WAY FOR SUPERVOLTAGE TRANSFORMERS

Pioneering again, Westinghouse has produced the third major breakthrough in power transformer development.

The first major breakthrough, forced-oil cooling, was developed by Westinghouse in 1940. It made practical for the first time construction of transformers up to 380,000 kva. The second breakthrough, the Schnabel car, also by Westinghouse, raised the practical kva to 450,000.

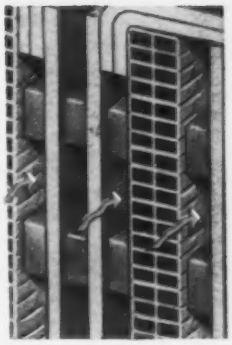
The *third* major breakthrough — Inner Cooling — makes it possible to build and ship transformers with ratings up to 600,000 kva or more. This is the biggest step to date toward construction of transformers that will meet the demands of the future.

Inner Cooling is essentially a means of taking full advantage of the materials used in conventional transformer construction. Present construction places the oil ducts on both sides of the coil consisting of multiple conductors wound in parallel. Inner-Cooled construction places the oil duct between the parallel-wound conductors, with cellulose material between adjacent coils. This construction takes full advantage of the superior dielectric strength of the cellulose material.

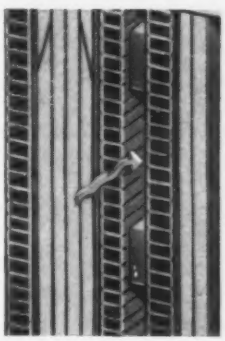
Inner Cooling promises transformers with lower impedances and improved performance, permits more kva in the same area. Space and weight reductions up to 25% for transformers of the same rating are now possible.

Inner Cooling — the third major breakthrough — was made possible through Plowback of Earnings into the far-flung Westinghouse facilities for research and development . . . facilities that are available to all Westinghouse divisions in their search for answers to future problems which are to be faced by America's electric utilities.

Call your Westinghouse representative for the full story on the new Inner-Cooled construction . . . or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania. J-70872



In conventional construction (above), oil flows over the two outside surfaces of the coil. With new Inner-Cooled construction (below), cooling oil flows over the inside of the coil surfaces.



◀ Here is graphic proof of the size reduction afforded by Inner-Cooled construction: the unit shown with Mr. C. W. Miller, Westinghouse Power Transformer Engineering Manager, is an Inner-Cooled Westinghouse 30/50 mva OA/FOA power transformer; the silhouette is that of a transformer with the same characteristics built with conventional construction.

YOU CAN BE SURE...IF IT'S Westinghouse

G&W

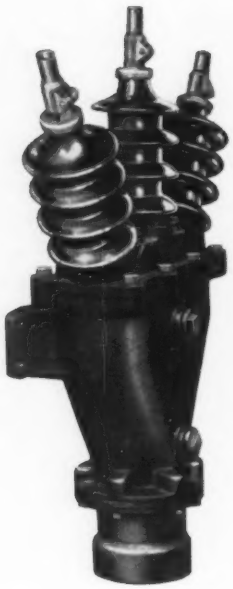
POTHEADS

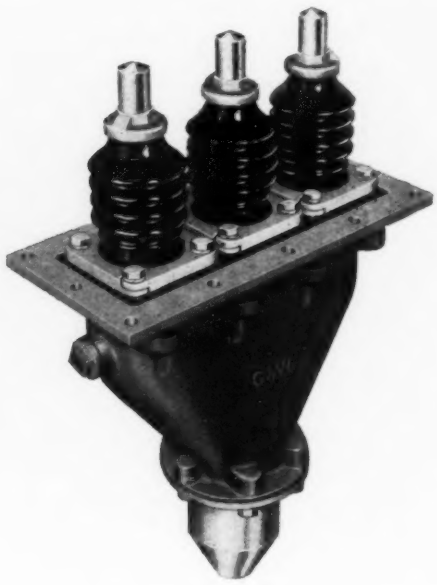
A DESIGN FOR EVERY CABLE

Only G&W can supply a complete pothead line—extra high voltage, capnut, soldered porcelain or disconnect—230,000 to 600 volts. High, medium and low pressure. Compound, oil and gas filled. Outdoor, indoor and for equipment mounting.

Specify G&W potheads for your cable terminations to be sure that potheads are available for every application.

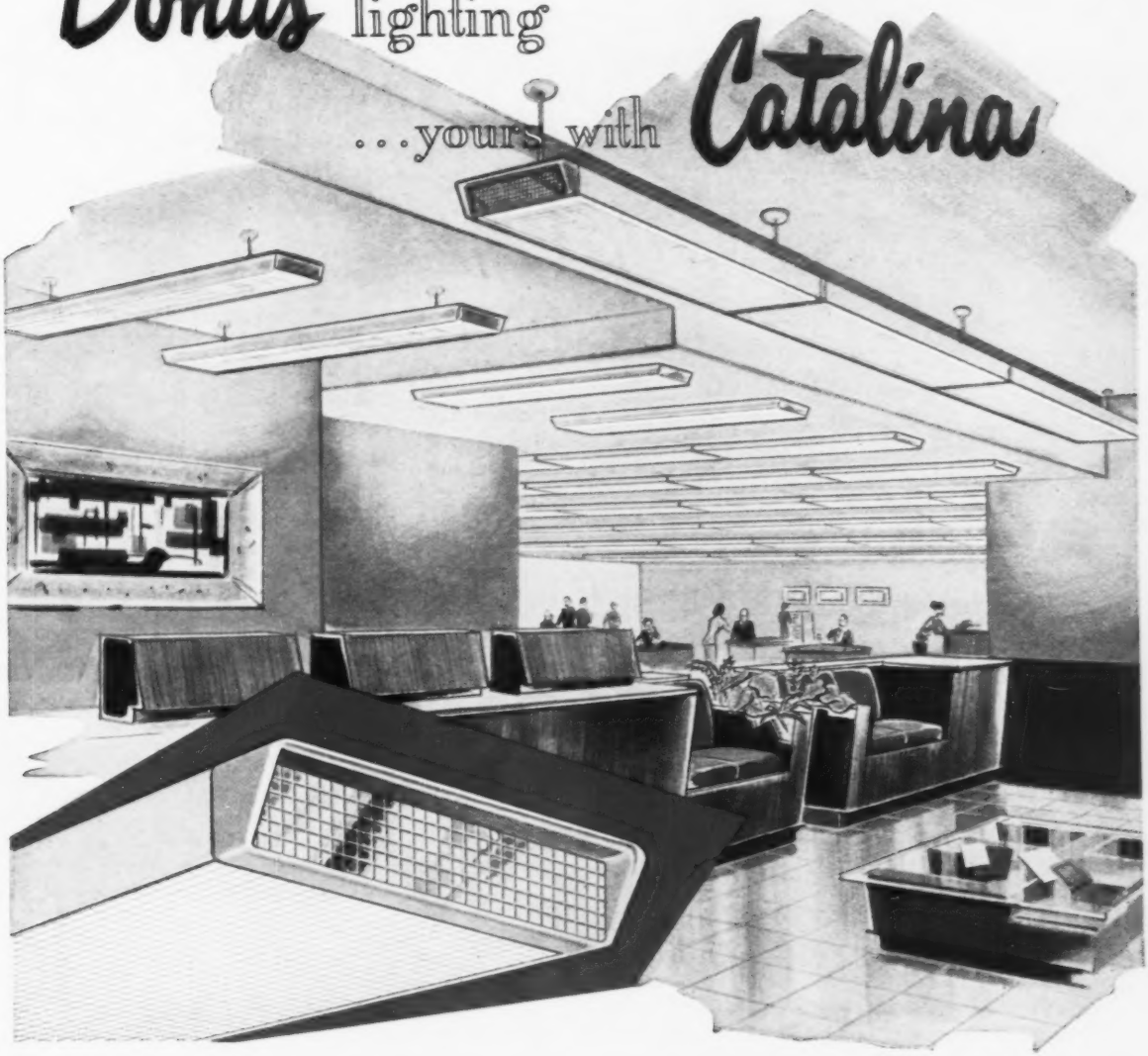
G&W ELECTRIC SPECIALTY CO.
3500 WEST 127TH ST. • BLUE ISLAND, ILL.





A581

Bonus lighting ...yours with Catalina



Everyone gets a big Bonus with the exciting, new Catalina! A big *bonus in unitized polystyrene,* a special Benjamin lightweight construction that assures straight-line, quick, easy, economical installation! A *bonus in streamlined beauty* with extremely low silhouette. A *bonus in comfort lighting* with a balanced upward component for controlled brightness contrast. A *bonus in value* with a price much lower than you'd expect to pay for this quality fixture. Suspended or surface mounted . . . your bonus beauty is Catalina!

R-358

BENJAMIN

. . . always the source of good lighting

Now Setting the Pace in COMMERCIAL LIGHTING

FOR DESCRIPTIVE BULLETIN ON CATALINA, WRITE BENJAMIN ELECTRIC MFG. CO., DEPT. J, DES PLAINES, ILLINOIS

It's Fully Magnetic!
It's Competitively Priced!
It's Available Now!

The Murray "MP" Plug-In Circuit Breaker

All The Functions Of Superior Circuit Protection At Competitive Prices

- Carries full rated load
- No thermal element, unaffected by heat
- Requires no complex derating
- Acts instantly on short circuits
- Never trips unnecessarily
- Resets immediately
- Tungsten silver alloy contacts for long life, trouble-free service
- Fast, easy installations
- Minimum callbacks, maximum profits

"Never before such complete circuit protection in a competitively priced, plug-in type breaker!"

THAT'S what contractors are saying about the new Murray "MP" breaker.

After years of development, Murray has succeeded in putting all the advantages of its original *fully magnetic* breaker into the new, competitively priced "MP".

Result: you can now offer your homeowner customers the best of circuit protection at *no increase in cost.*

Check the "MP" features listed here. You'll see why new "MP" breakers – backed by a full line of "MP" load centers – can be more profitable to handle for both contractor and wholesaler alike.

Next time you order circuit breaker equipment, ask for the new fully magnetic "MP" line – you'll be glad you did.

BACKED BY A FULL LINE OF "MP" PLUG-IN LOAD CENTERS

de luxe features at competitive prices!

- from 2 to 42 circuits
- famous Murray easy-to-wire features
- interchangeable covers
- three hole mounting
- doors on 12, 16, 20 and split bus boxes
- provision for doorlocks
- raintight boxes
- alternate polarity for 2 pole circuits

Murray Manufacturing Corp. (Dept. ET)
1250 Atlantic Avenue, Brooklyn 16, N.Y.

Gentlemen: Please rush me: ☐ full information on new "MP" line . . . ☐ new 1958 Murray Catalog.

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Company_____

Address_____

City_____ State_____

Type of business_____

Murray

murray

MANUFACTURING CORPORATION • 1250 Atlantic Ave., B'klyn 16, N.Y.

750 MCM Single Conductor 91 Strands, 5KV Shielded SUPER-PARARITE PARAPRENE CABLE.

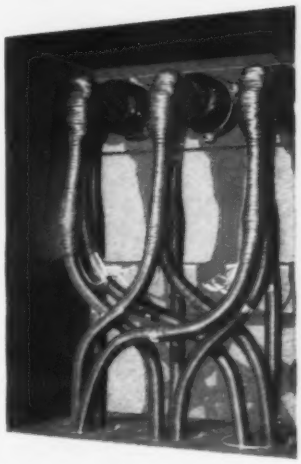
PARANITE®

SUPER-PARARITE® PARAPRENE®

CABLE

Installed at Turkey Creek

Here's another example of power—Paranite—and American industry . . . the selection of Super-Pararite Paraprene Cable for the new Turkey Creek Pumping Station at Kansas City, Missouri. The Super-Pararite butyl conductor insulation is recognized for superior resistance to heat, cold, moisture, oxidation and ozone, while the Paraprene neoprene jacket possesses inherent resistance to sunlight, abrasion, ozone, heat, oil and chemicals . . . one of many Paranite products which has earned the industry reputation—"IF IT'S PARANITE IT'S RIGHT."®



PARANITE WIRE AND CABLE DIVISION

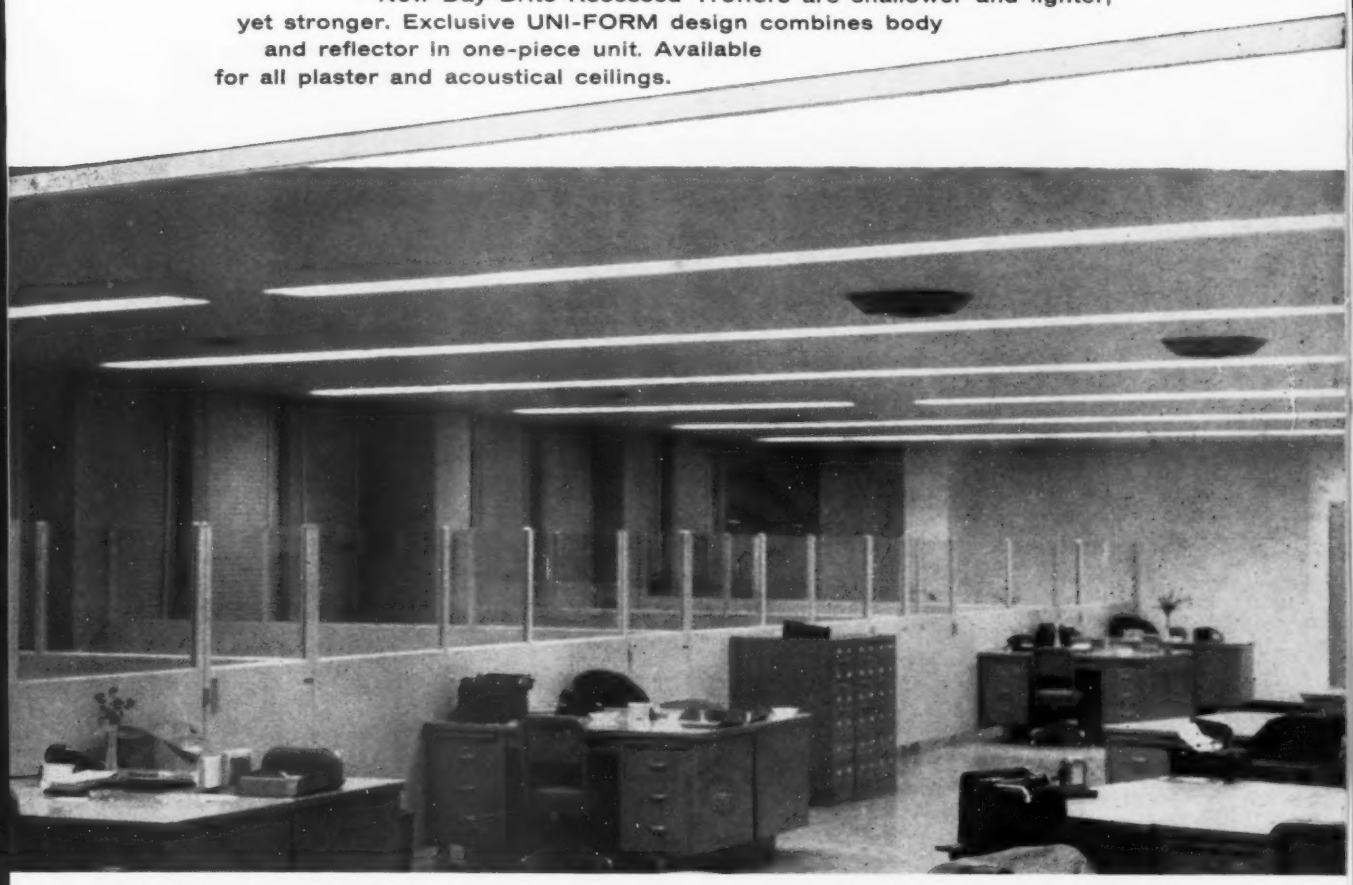
Essex Wire Corporation, Fort Wayne 6, Indiana

MANUFACTURING PLANTS: Birmingham, Ala.; Anaheim, Calif.; Jonesboro, Ind.; Marion, Ind.; Tiffin, Ohio

Sales Offices in all Principal Cities

DAY-BRITE TROFFERS

New Day-Brite Recessed Troffers are shallower and lighter, yet stronger. Exclusive UNI-FORM design combines body and reflector in one-piece unit. Available for all plaster and acoustical ceilings.



Simple, functional lighting by Day-Brite was the logical choice for the Accounting Department of the new Chicago Sun-Times Building. NAESS and MURPHY, *Architect-Engineers.* GEORGE A. FULLER CO., *General Contractor.* WHITE CITY ELECTRIC CO., *Electrical Contractor.*

...selected for the world's most efficient newspaper plant

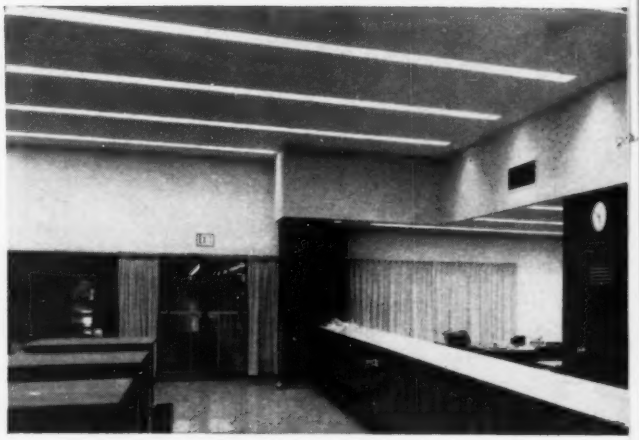
HERE'S WHY: Day-Brite Troffers offer all of the cost-saving advantages provided by modular construction.

With weight reduced as much as one-third, installation is safer and faster . . . with less ceiling load.

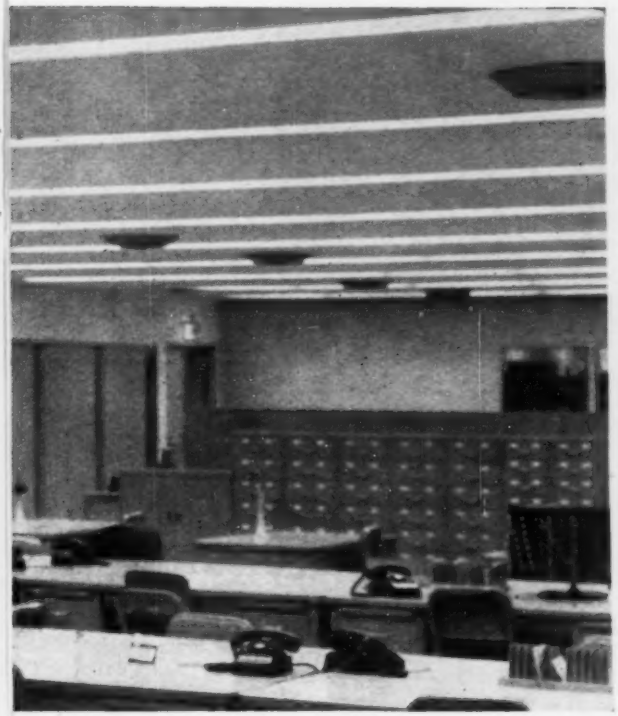
Shallow dimensions allow for greater freedom of placement and simplify mechanical planning.

Designed with adjustable suspension features, separable hinges, plenty of knock-outs . . . and factory pre-assembled to save time on the job.

Want more details? Write for your copy of 16-page, illustrated booklet on *Modular Lighting.* Or call your Day-Brite representative listed in the Yellow Pages.



Recessed Troffers deliver high lighting levels with low brightness in the Sun-Times Public Service Department.



DAY-BRITE...the Contractor's Choice

Harvey T. Nack, Jr. and Bernard L. Padgett of White City Electric Co.

"It's a pleasure to install DAY-BRITE"

...says HARVEY T. NACK, JR., President
White City Electric Company
Chicago, Illinois

"Day-Brite fixtures always arrive on the job looking good. They're easy to unpack and handle . . . all parts are included, and there's a minimum of breakage.

"They go up easy and stay put. Call-backs are practically unheard of.

"It's a pleasure to install Day-Brite, the leader in the lighting field. Day-Brite stands firmly behind their product and their field representatives who, incidentally, provide the finest service in the industry." Z-152

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DAY-BRITE
Lighting Fixtures

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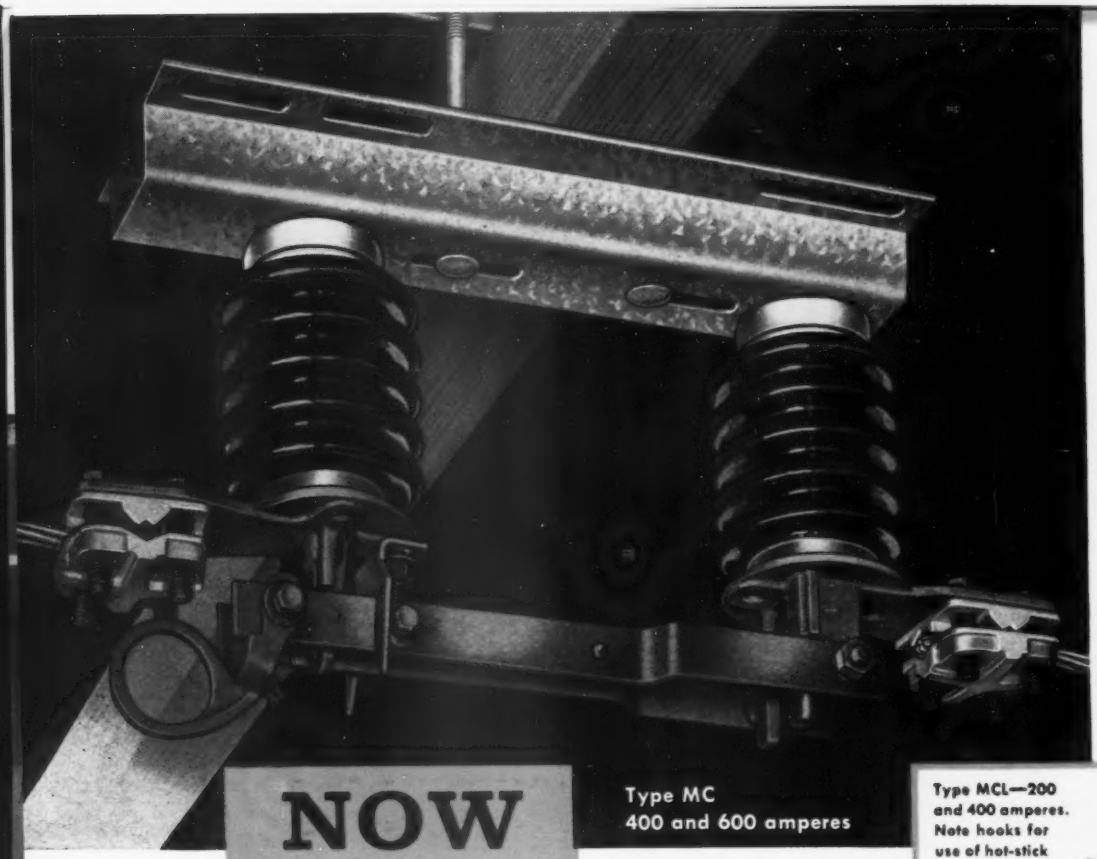
Certified Lighting for a Better America

NATION'S LARGEST MANUFACTURER OF COMMERCIAL AND INDUSTRIAL LIGHTING EQUIPMENT

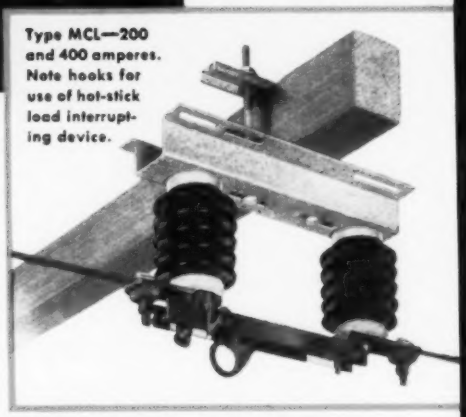
with low brightness in the San Rimas Public Service Department.



Write today for the Kearney Catalog, Section 6, on Hook Operated Disconnects

NOW

Type MC
400 and 600 amperes



Type MCL—200 and 400 amperes. Note hooks for use of hot-stick load interrupting device.

peak performance at lowest cost with KEARNEY hook operated DISCONNECTS

Sturdy, simplified construction of Kearney Center Bolt type Disconnect Switches offers field-proved performance with substantial cost savings. Current-carrying parts comply with all NEMA standards for heat rise and surge capacity. One-piece casting of terminal pads and contacts minimizes transfer points, reduces heat. Blades and blade lock are exceptionally strong and rigid. See and test this superior equipment—discover how *you* can get maximum performance at minimum cost.

- **Blade withstands 80 lbs. thrust at 90° to pull ring without distorting.**
- **90° blade stop in open position checks blade from falling free.**
- **Positive latch and pry-out prevent galling.**
- **Hinges carry no current, permit best mechanical design.**

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FOR BETTER CONSTRUCTION—SAFER MAINTENANCE

Specify Kearney Products

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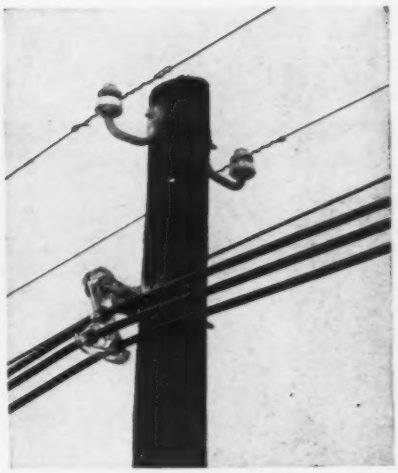
NATION'S LARGEST MANUFACTURER OF COMMERCIAL AND INDUSTRIAL LIGHTING EQUIPMENT

New Roeclamp* Cable System Costs 60% Less than Self-Supporting Cables, Minimizes Tree Problems, Installs with Ease, Looks Better!



New Roebling Aerial Spaced System with ROECLAMP requires only one foot of clearance through trees! Note improved, compact appearance. No crossarms are needed.

Designed for 5kv systems (2400/4160Y and 4800 v delta) and 8kv systems (4800/8320Y and 7200 v delta), the Roebling Aerial Spaced System actually costs 60% less than conventional self-supporting cables. It provides a neat, compact appearance, improved voltage regulation, higher current-carrying capacity, and positive phase identification.

Up to three conductors can be carried by ROECLAMPS, which are suspended from a strong messenger. The messenger also provides protection against lightning and falling limbs.

Aluminum conductors come in 17 standard sizes and strand constructions, and are made with a greater number of finer strands for extra flexibility. Standard insulation is extruded ROEPLASTIC® P-11R7 (other extruded insulations available). ROECLAMPS come complete with grommets to fit cables and messenger you order.

Ask your Roebling representative to show you the remarkable new ROECLAMP. He'll tell you more, too, about the unusual savings and improvements you can effect with the ROECLAMP System, or write Electrical Wire Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

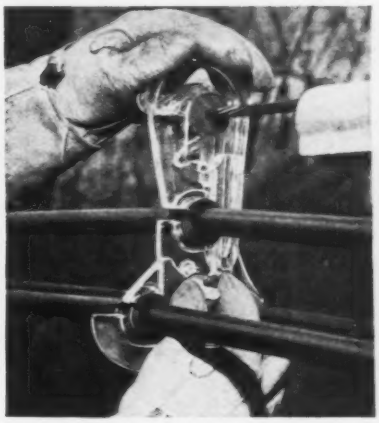
ROEBLING

Branch Offices in Principal Cities
Subsidiary of The Colorado Fuel and Iron Corporation

Roeclamp has unit construction... installs in seconds—without tools!

One motion and ROECLAMP is on messenger and ready to receive conductors. Phase changes and repairs do not necessitate removal of clamp. ROECLAMP comes complete with grommets to fit messenger and conductors you order.

Note how easily conductors drop into place. Installation is measured in seconds, even with "boxing gloves" on. ROECLAMP is Plexiglas†, tests to over 1000-lb. breaking strength, offers outstanding weather resistance, best possible electrical properties.



35 ROECLAMPS are required every 1000 feet. Installation is completed by hand-tightening of nut. Not even a screw driver is required!

*Pat. pending
†Reg. T.M.—Rohm & Haas Co.

ELECTRA'S HUSBAND

On Paying Up

"STOP mumbling," said Electra as she surveyed the litter on the dining room table. "After all, it's only money."

I was too tired and exasperated to deign to reply. Instead I merely picked up the pen and the form 1040 and indicated where she was to sign. Then I began to collect the used notes, worn-down erasers, bills and other assorted debris and sorted between the wastebasket and the Taxpayer's Defense file. The latter, I knew, would last only as long as my caution prevailed over Electra's predilection for disposing of such things at the earliest possible moment.

"You look as though you could use a martini," said Electra. "I can't see why this annual bout with Uncle Sam should be such an ordeal."

"Every year the revenuers make it tougher to be honest," I complained. "They change the form, add new gimmicks and in general make it pretty miserable for anyone who is up near the five-figure income level."

"Well if you would be systematic about it all year long," jibed Electra. "I don't think you'd have this awful mess right around April Fool's Day every year."

"Systematic," I exploded. "Why even a cross-eyed accountant couldn't be systematic about trying to keep track of all of the charges and deductions that are allowed, disallowed, carried over and partially chargeable. It was bad enough before. But this year they have outdone themselves in the matter of making income tax reporting a hair shirt."

"Oh, it couldn't be that bad," argued Electra. "To hear you talk in past years it would seem that nothing could be done to make income tax reporting more exasperating or complicated than it was."

"Well they outdid themselves at the beginning of this year," I retorted. "It used to be that people who had to travel on their jobs and were reimbursed for their expenses by the company just ignored the extra income on the theory that it was balanced off by the cost of their travel—and it was too and more. Every businessman will tell you that he never can collect all of the money that he spends on a business trip. There are just too many little extras and too many things that slip by that never get recorded. But at the first of this year, the big stone faces in Washington decreed that all expense money received had to be accounted for—minutely. Not only that, the taxpayer had to deduct from his entertainment expenses the cost that he normally would have spent for a meal or a drink. I've honestly tried to do it since January and I'll have to admit that, if I were placed on the stand under oath to try to unsnarl the figures, I would appear to be either a crook or a moron because even I can't make them look like anything but a Chinese laundry price list."

"Why that's absurd," Electra was getting steamed up. "Do you mean to tell me that when you go out for your three-martini lunches with a customer that you'd have to deduct from your expense report the price you would normally pay for a lunch?"

"Exactly," I said. "And furthermore if you wanted to be real safe you would have to get a receipt for every nickel you spent. Can you imagine asking a porter for a receipt for the tip you gave him when you get off the Pullman in the morning?"

"It sounds like bureaucracy run rampant," said Electra. "I predict here and now that it won't work and if you businessmen had any red blood left in you, you'd start a taxpayers' revolution. I guarantee that American womanhood will back you up."

"You're right, as usual," I laughed, "but don't let it go to your head. The income tax boys, after getting the whole business community up in arms over their stupidity, have backed down already. Now they tell us that it won't be necessary to report expense accounts on our 1958 returns if we make an accounting to our bosses and they accept the expense account. Maybe the power of public opinion isn't dead in this country yet."

"Well it was a silly ruling," observed Electra, "but I suppose that there are lots of people who really abuse the expense account privilege to avoid paying taxes. I don't think that's so good either."

"You're right again and I am pretty sure that the internal revenue service recognizes it. At least their recent ruling indicates they think that the average businessman is a pretty honest sort of guy. They are still laying for the chiseler, however, because people who work for themselves or who have expenses that are not reimbursed by a company still have to give a detailed report. That will give the investigators a chance to concentrate on the sour apples."

"I guess none of us should complain too much about paying taxes," mused Electra. "It seems like we're calling on the government to do an awful lot of things these days and it all takes money."

"I don't think that anybody objects to paying taxes but I do think they object if they are collected with arrogance and indifference to public convenience. This latest shifting in policy is a good example of bureaucracy at work. It might be a good sample of what we could expect if we lived in Russia or had a wholly socialist government here. We'd have rulings and counterrulings, edicts and counteredicts until we'd be an even more confused people than we are now—if that's possible."

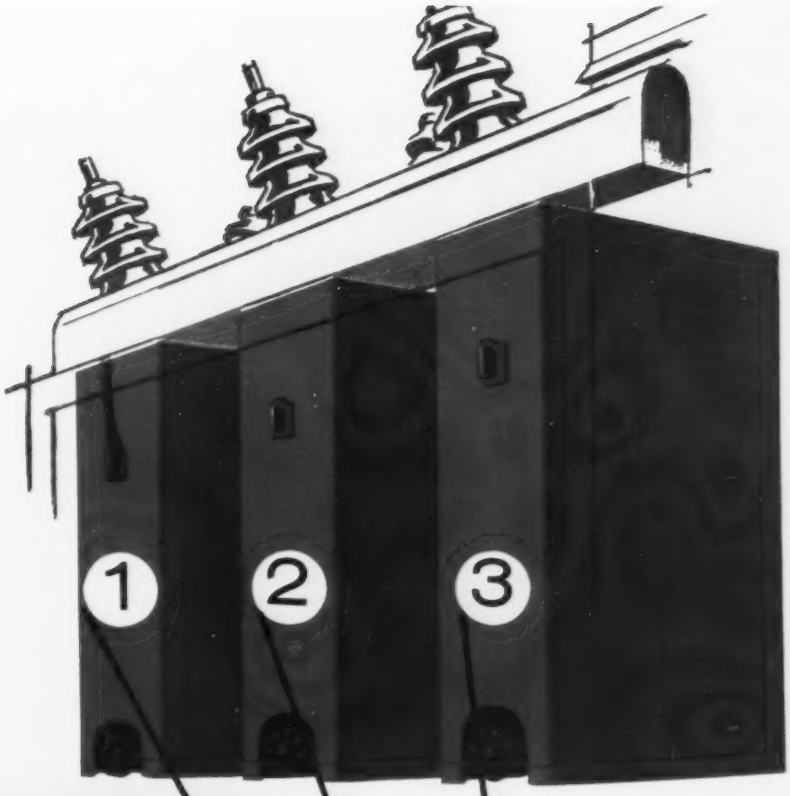
"Oh, it's possible all right," laughed Electra. "Every time Congress meets there is political pressure to tax more or to exempt more and in trying to do both without making it appear against them back home among the voters they pass laws that require the revenuers to write more complicated tax forms. It's a game. It can go on forever.

"The coming generations had better be conditioned for it. I heard that the new educational toys are being designed to condition kids to live in the world they are inheriting. No matter how you put them together, they are wrong. That's income tax!"

messenger and conductors you order.

†Reg. T.M.—Rohm & Haas Co.

3 tanks are better than 1



for positive protection with outdoor distribution breakers

Ratings:
14.4 and 23 kv,
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Just like big breakers, there are 3 tanks for complete phase isolation. This means positive protection against internal phase-to-phase flashover.

Extra protection is only one of the many benefits you obtain in 3-tank design. Maintenance is easier; tanks are smaller and easier to handle; and oil contamination is reduced.

There is no extra cost for this 3-tank breaker with big-breaker features.

For the complete story ask for Bulletin 71B7946. Call your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

A-C ALLIS CHALMERS

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TIME-DELAY PROTECTION

Shawmut "t-d" Renewables have the best time delay characteristics of any renewable fuse. The t-d link gives maximum time delay protection in the higher current ranges as well as in the overload zone. Short-circuit operation is instantaneous, along with a reduction in the rate of rise of recovery voltage. The t-d link notches blow one after the other with rheostat-like action.

HIGH QUALITY - LOW COST

Precision-made. No soldered, welded or steel parts. Simple, sturdy, dependable. Easy to install, take apart or renew. Interchangeable links, renewable parts. Large silver-plated contacts. Adequate 2-way venting.

COMPLETELY RENEWABLE
FUSE OR LINK

Complete fuses and/or renewal links are available for either 250 or 600 V circuits; in ferrule ratings, from 0-60 Amps.; in knife-blade ratings, from 70 to 600 Amps.

Order now or ask for t-d Bulletin 500

*U.S. Patent No. 2,560,138 © The Chase Shawmut Co. 1958

t-d – "Awake At The Switch"

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LETTERS TO THE EDITOR

Cash Investments

To the Editor:

I read the article in the February issue of *Electrical West* on domestic load building by utilities with much interest. The subject again came forcibly to my attention just now when I read Larry Wray's editorial in the February issue *Electrical Merchandising*, in which he issued a challenge to utilities and ended by saying: "It's time for some cash investment in your dealer sales force."

I wonder if this whole subject isn't important enough so your publication would be willing to publish letters from utility sales managers, distributors and dealers, pointing out what they believe should be done on any one or all of the following questions proposed by Larry Wray:

1. Cash bonus to dealer salesmen on each sale of a range, water heater or dryer, or particular load-building device the utility wants to promote.

2. Cash prizes to dealers or their salesmen for best performance to quota in a sales campaign.

3. Bonus payments to dealers for live floor demonstrations, home demonstrations, free trial installations, window or floor displays.

4. Dealer awards for the outstanding promotion of the year or the best record against a predetermined sales campaign quota—either in trophy, trip or merchandise.

Personally I'm convinced that some very sound cash investments are available to the utilities through dealer channels.

K. L. Hampton
Division Commercial Manager, PG and E, Fresno

Any others convinced? We'd like to hear —The Editors

Likes Management Series

To the Editor:

I think *Electrical West* is to be congratulated on the excellent series of articles now appearing on management techniques.

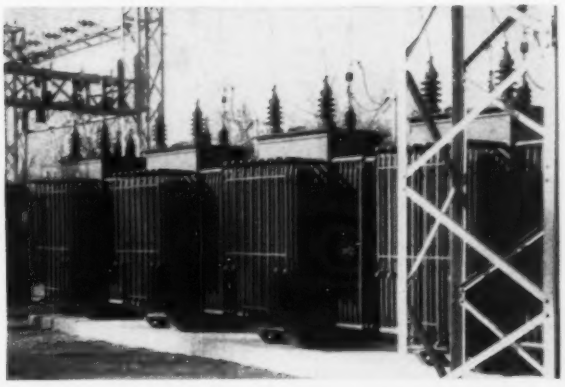
We receive quite a number of magazines containing articles of this sort, including *Nation's Business*, but Dr. Phelan not only seems to have the most penetrating insight into this type of management problem but also he presents his information with a surprising amount of conciseness and clarity. The two articles published so far have been packed with useful information, which we were able to put right to work. I know that many of my friends and associates are also reading these articles and concur in my opinion.

I hope the series will continue for some time, because this is a field of management which has not received enough attention and about which we all have much to learn.

Charles E. Gadsby
Gadsby Advertising
San Francisco

Mr. W. H. Brown, right, reviews plans with Kuhlman salesman, Andrew H. Baxter.

"EXCELLENT PAST EXPERIENCE...
that's why we specified Kuhlman"



Doswell, Virginia looks ahead. When planning this four Kuhlman power transformer substation, approximately 50% reserve capacity was allowed for future growth.

"We particularly like the design of Kuhlman transformers," says W. H. Brown, Manager of the above installation at Doswell, Virginia.

"They are rugged in construction and generously provide all the features we consider important.

"We are also impressed with their height, which solves our problem of maintaining required ground clearances.

"Then, too, delivery was according to schedule which, in itself, is no little consideration."

This installation of three Kuhlman single phase power transformers, plus a spare, serves the growing rural and small industrial community of Doswell, Virginia. Although some of the load is polyphase, single phase units are used rather than three phase to give greater versatility for serving the system's single phase farm and residential lines.

Like Mr. Brown, you'll find Kuhlman small power transformers meet all your requirements —especially those features important to you.

KUHLMAN ELECTRIC COMPANY

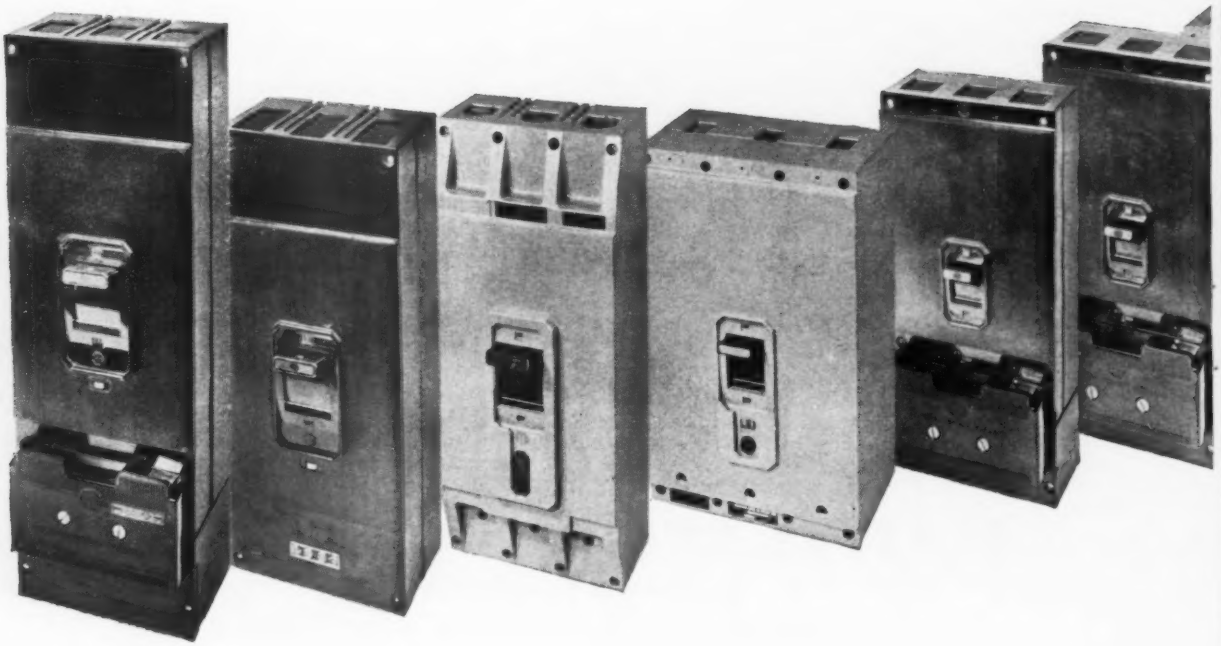
General Offices: Birmingham, Michigan

WESTERN DIVISION • SALINAS, CALIFORNIA

MOLDED CASE CIRCUIT BREAKERS

YOU GET "EXTRA QUALITY —AT NO EXTRA COST"

in Industry's Most Complete and Diversified Line



From the smallest circuit breakers for lighting circuit protection, through I-T-E's exclusive Cordons—with 100,000 amp interrupting capacities—to the many special-purpose breakers, such as the 400 cycle, 1000 v selective trip breaker designed for Navy use, I-T-E molded case circuit breakers constitute industry's most complete line.

Not only is the I-T-E line the most complete and most diversified, but I-T-E's famed "extra quality—at no extra cost" is built into every product which bears the I-T-E label. And you can depend on the nation-wide network of I-T-E distributors and field engineers to give you second-to-none service. I-T-E Circuit Breaker Co., Small Air Circuit Breaker Division, 19th and Hamilton Streets, Philadelphia 30.

I-T-E CIRCUIT BREAKER COMPANY

PHILADELPHIA, PENNSYLVANIA

editorial views

Fight for Free Speech

IF THE Department of Internal Revenue has its way, another prop to American freedom will disappear. By disallowing the expenses of advertising directed to telling the story of free enterprise vs socialism, this creature of the Treasury Department leaves the business-managed utility enterprises naked and defenseless before the assault of socialist politicians and power-hungry bureaucrats. Fortunately the decision of the Internal Revenue Department will be tested in the courts. The mere fact that it has to be tested indicates that the country has gone a long way down the path from its traditional and historical tradition of justice and equality for all.

Utilities have every right to advertise to protect their legitimate business interests and charge that advertising as an operating expense. The investors who have built these marvelous power systems have just as much right to protection of their savings against destructive socialist encroachment as does any business that buys insurance to protect it from thieves and vandals. Up to this time, the Internal Revenue Department has allowed such business insurance charges as a legitimate operating expense.

But this is only part of the story. The adversaries of the business-managed utilities operate under a tax-free, government-subsidized and taxpayer-supported campaign to destroy free enterprise. The public-power senators and congressmen travel at government expense to make speeches against the utilities and are paid by the taxpayers while so doing. The labor unions which operate under tax-free, nonprofit charters are heavy contributors of their members' funds to pro-public power projects. For example, the Hells Canyon Dam Assn., which so bitterly fought the Idaho Power developments on the Snake, was financed by donations from such incongruous union treasuries as the International Ladies Garment Workers Union ($3,000), United Automobile Workers ($4,000), the International Brotherhood of Boilermakers ($1,500) and a long list of other unions and labor organizations whose contributions made up approximately 60% of the entire funds of the association.

Thus, electric utilities as corporate citizens are being deprived of their rights to tell the public what effects the attacks against them will have on taxes, freedom of choice, the rights of American citizens and the future of the country. At the same time their attackers are being granted the special privileges accorded only to union demagogues and the duly elected "servants" of the people.

The implications of this situation are enormous. In essence, one segment of the federal government can decide it wants to take over a piece of American business; another segment of the government, by ukase, legally hampers the right of the attacked group to defend itself. This is not the form of Americanism that histories state was the republic's foundation.

More Action Due

"LET'S get out and sell" has been the burden of the industry's conference speakers for several years. Sometimes it has seemed that the precept, exhausted in meeting, would not get back to the office. No such impression, however, came out of the recent Business Development conference of the Pacific Coast Electrical Assn., largest single gathering of this group since World War II. The carefully planned program brought in all selling branches of the industry and some of their allies. There was a strong feeling of interdependence, a willingness to see the other fellow's point of view, an underlying suggestion of "let's sell him, not tell him."

Speakers were confident about the future but there was a minimum of talk about the fabulous things to come; a maximum of hard-headed good sense about selling what we have now. And

this conference was far from a mutual admiration society. More than one speaker criticized the industry severely. While idle carping found the delegates ready and able to defend themselves, honest criticism brought thoughtful attention. In fact it was a thoughtful conference and above all the impressions carried away from it was the conviction that, while the industry was not going to stop talking "sell," it was finally going out to do it—aggressively.

New Depreciation Scheme

METHODS of depreciating the utility property to insure protection of the invested capital used in the public service are as controversial as they are varied. In its 1957 accounting procedures, the Sacramento Municipal Utility District adopted a depreciation method based on the principle of providing accruals based on the fair value of its property. This system, known as the price-level method, recognizes that a utility should collect in revenues an amount to cover the fair value of the property consumed in its operations. The basic difference is in the interpretation of fair value as compared to original cost. In inflationary periods, this method tends to accrue depreciation money faster because the appraised fair value of the property increases year by year. For example, the effect of adopting the price-level method on the SMUD properties was to increase depreciation accruals by $665,000 and, incidentally, reduce net income by that same amount. According to SMUD's annual report, the depreciation computed on the cost of the property would have been $1,507,000 but under the new method the accrual totaled $2,172,000.

While the officials of the Sacramento utility apparently believe that depreciation based on cost is not the best measure of the property consumed in operations, most regulatory commissions take a different stand. SMUD, being a nonregulated utility, may select any accounting method it chooses. Regulated utilities, on the other hand, must abide by commission regulations, which stress the uniformity and stability of the straight line or sinking fund methods of accruals. Admittedly, in periods of inflation, the latter methods do not recapture the replacement cost of plant consumed in public service. Accountants should be interested in comparing the over-all effects of the two depreciation theories in periods of both inflation and recession. One thing is sure, discussions about them are sure to be controversial.

IT is a startling situation we face. Our rate of load growth is slipping just at the time we are adding the greatest amount of capacity in history. Certainly the drop in new home starts is hurting, as well as the drop in industrial activity. If it were not for this new capacity, started three years ago, with its capital outlay and fixed charges, the utilities might be less concerned. Converting the industrial drop into higher revenue income residential and commercial load, they might be able to hold the net income steady. But you just can't stop, hide, or cut off that 16.4 *million new kilowatts of capacity now being installed. Management will soon become more concerned than it is at present if this downward sliding of the load situation should continue. And right here is one of the first major hurdles to be cleared — that of convincing utility management that the selling of appliances and equipment and the promotional efforts of salespeople are truly important to them.*—James T. Coatsworth, commercial director, Edison Electric Institute, before the Business Development Section of PCEA.

HIGHLY POLISHED SURFACE of thrust bearing runner plate affords dependable operation of G-E hydro-generators. When completed, this bearing will support 3,816,000 pounds. Watching operator "stone" surface for smoothness are General Electric's R. B. Bodine (left), Mgr.—Large Generator and Converter Sales, and R. B. McKeeby, Mgr.—Mechanical Design Engineering, Large Motor & Generator Dept.

FOR MODERN SYSTEM PLANNING . . .

Intensive development of hydro sites is an answer to "peaking"

Utility planning engineers find that intensive use of hydro-electric developments for supplying "peaking power" is an economic answer to relatively high investment costs for generating capacity. Hydro-electric sites with limited storage, or with the possibility of pumped storage, are being used effectively to supply "peaking power." General Electric hydro-generators driven by modern hydraulic turbines provide for all requirements of this type of application. One of the most important components contributing to the outstanding performance of these generators is the General Electric spring thrust bearing.

RAPID START

Generating equipment for peaking service must be started and stopped each day, perhaps several times daily. General Electric hydro-generators driven by hydraulic turbines can be started and loaded as often and as rapidly as required. No involved starting procedures are necessary to insure satisfactory operation.

OUTSTANDING RELIABILITY

Operating reliability of General Electric thrust bearings has been nearly perfect since this design was introduced in 1945. Since then, over 300 bearings have operated for more than 2400 machine-years with only 12 machine-days' outage during commercial operation due to thrust bearings. This is an average outage of only six hours per machine in fifty years.

3,816,000 LB. BEARING LOAD

As testimony of the great capacity of General Electric thrust bearings, the bearing pictured above will support a load of 3,816,000 pounds. In one installation, twelve similar bearings each carry a load of 4,000,000 pounds, a third more than the previous high which is also a General Electric installation.

For more information on how G-E thrust bearings can help you meet peaking requirements through the development of hydro-electric sites, contact your General Electric Apparatus Sales office or request bulletin GEA-2251E from General Electric Company, Section 301-376, Schenectady 5, N. Y.

MORE POWER TO AMERICA

GENERAL ELECTRIC

ELECTRICAL WEST SPOKESMAN FOR MOST HIGHLY ELECTRIFIED REGION OF THE U.S. VOL. 120, NO. 4 APRIL 1958

CONTROL...

Catalyst for Industry

Westinghouse's A. C. Montieth, in a recent address, supposed a plant manager with the problem of increasing his factory output by 30%. The manager's solution was to install automatic control equipment, so that the increased production would require no more factory workers. The power and control equipment which the manager would have to install to do the job would require a whopping 70% increase in the use of kilowatt-hours to obtain the 30% increase in output. This dramatic illustration of the catalytic power of automatic control is the reason why ELECTRICAL WEST's editors have selected control as a subject of value for its power oriented readers.

Control Revolution

Time was when the subject of control was defined by whom you were talking to and what you were talking about. In those days, control had a sort of gender—it was electrical, mechanical, electronic, just like the man who designed it. It wasn't proper to mix genders, mechanical equipment was mechanically controlled. Electron devices for voltage generator control were suspect for many years.

Under the forced draft of World War II, the control systems concept bore fruit. Enemy aircraft was sought out electronically, tracked by an electromechanical computer, and shot down with guns positioned by a hydraulic system. All of the parts were tied together, the crew was on hand to keep count. Kindred automatic control system performing human — and superhuman — tasks have invaded industry, creating a technological revolution as far reaching as the power revolution of the 1800s. Looking to the future, General Electric's Dr. F. Meade Bailey says, "Punch cards will control sequences, keep track of quantities, and be used to tabulate daily performance. Automatic daily, and perhaps hourly, audits of the process will enable factory superintendents to keep work flow at a maximum, and make use of investment equipment. The resulting per unit product saving will warrant even further investments of funds for automation."

The control function has changed its role as an auxiliary device to become the brains and nervous systems around which whole productive processes are built. The control industry today is something larger than $3 billion. The curve benders hasten to qualify this figure as dependent on the definition of control. They do not hedge the fact that the industry appears to be tripling on an eight-year cycle. One of the main reasons was clearly stated by a control manufacturer, "If you sell one system, competition forces the whole industry to go along." So impressive are the economic advantages that computing equipment alone grew from near nothing in 1940 to an estimated $2 billion plus by 1960. In the continuous process industry, control components are on the increase, running from 5% to 20% of the capital investment. Automatic machine tools run from 20% to 60% of cost in control devices.

Utility Applications

In the utility industry, engineering leaders are convinced that future gains in power station heat rates, as well as the efficiencies of individual system component, will be at a much slower rate. For this reason, they view more sophisticated controls as holding the best promise for economic gains in the years ahead. Already, computer optimized designs, economic dispatch, remote control hydro and substation, centralized steam plant control are taking their place on the utility scene. Control gains on the nuclear scene will be invaluable, making possible economic nuclear power.

How Much More?

To the factory superintendent, leery but respectful of the tape directed machinery, and the utility operator who turns over his system operating job to an electronic computer, the question of "how much more is in store" is very real. The question seems to have been answered by Sputnik—and very positively. Today, loose figures of $5 to $10 billion for the development of manned satellites and for antimissile missiles are being discussed. More than half of these development dollars would be spent for control systems. A major target is the miniaturized or vest pocket computer. A recent survey asked control engineers working on military projects if they thought the military systems they were working on had industrial applications. 97% said yes.

Join 'em—or else. Just as digital computers grew out of World War II and came to play an important part in utility operations, the space age will make a great many contributions and additions to the control scene. Whether or not laymen understand the goings-on in the little black boxes, they dare not fight them—it's so economic to join them.

CONTROL...

Evolution of a Labor Saver

T. M. Stout, Thompson-Ramo-Wooldridge Products Co., Los Angeles, Calif.

". . . If every instrument could accomplish its own work, obeying or anticipating the will of others . . . if the shuttle would weave and the pick touch the lyre without a hand to guide them, chief workmen would not need servants, nor masters slaves."

Aristotle, Politics, c. 350 B. C.

How close are we to the workerless utopia which Aristotle envisioned? Some of his dreams have already been realized. Power looms, directed by punched cards, are almost 200 years old. Mechanical music makers have a long history, from clockwork music boxes through the player piano to the modern juke box. And considerable progress is being made toward the development of machines and processes which, if they do not quite operate by themselves, operate with a very minimum amount of human supervision.

An idea of how much progress has been made can be gained by reviewing the evolution of control techniques used in the manufacture of metals, glass, plastics, chemicals, paper, rubber, gasoline and similar materials. These products are made today in plants that are characterized by sizable material flow rates, extensive use of mechanical energy, and use of humans almost entirely in supervisory and maintenance jobs. In many of these plants, widespread application of automatic control devices has already reduced the number of people required for process supervision to a bare minimum.

How did this situation develop?

Processes for the manufacture of metals, dyes, wine, cosmetics and such basic materials as salt, lime, alum and asphalt were developed many centuries before Aristotle. Except perhaps for omission of the magic words, the control procedures used by the operators of these early processes must have resembled those used by medieval alchemists in trying to transmute base metals into gold. (Or by a modern housewife who still makes biscuits from an old-fashioned recipe.) The raw materials were undoubtedly placed in a container and subjected to a succession of steps, determined by experiment, which was expected to produce the desired result. If the raw materials were not uniform, the fire became too hot, or there were other deviations from the established procedures, a batch might be spoiled. As long as the batches were small, obviously spoiled products could be discarded with no great loss. If the spoilage was not obvious, the material went to the consumer. Since their requirements were not too critical and their acceptance tests not very refined, the consumers must have tolerated wide variations in product quality.

With the development of measur-

It Started With Aristotle

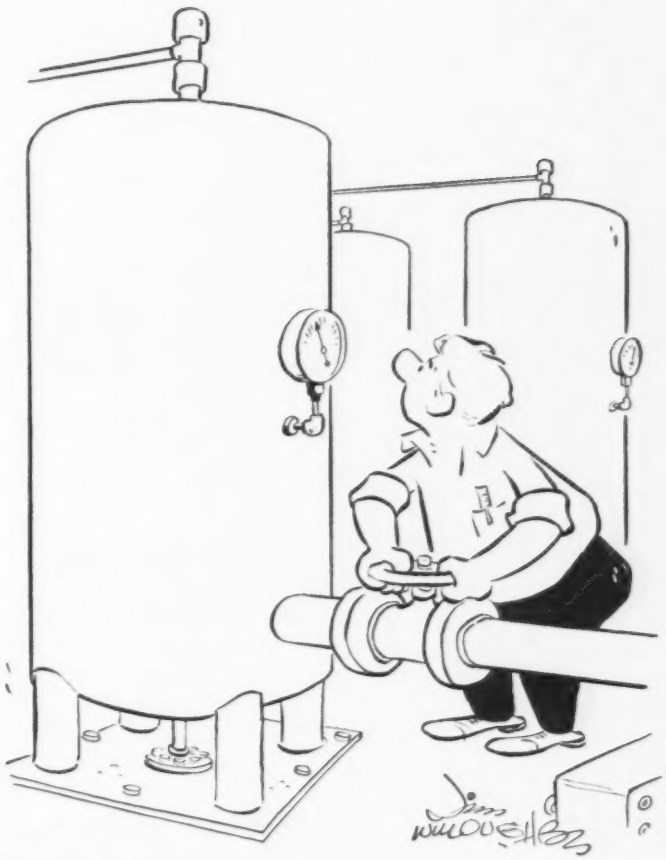
ing devices, a significant improvement in the process control became possible. An operator could, for example, read a thermometer and adjust a valve to cause the temperature to vary in some prescribed manner with time. In some cases, he might change the amount of fuel to a heater; in others, the flow rate of water in a cooling system. As long as the process was relatively simple, insensitive to disturbances and upset only infrequently, an alert and conscientious operator could do a reasonably good job.

In principle, at least, the advent of continuous processes simplified the operator's task. The temperatures and other controlled variables were to be maintained at more or less constant values, and there was no need to vary them periodically through a prescribed cycle, as in the batch processes. In practice, however, the operators were still kept busy by the necessity for readjusting the process after upsets caused by changes in raw material flow rates and compositions, cooling water temperatures, heating values of fuels, equipment breakdowns and other unpredictable events.

Much better control—and, in fact, manufacture of products which could otherwise not be made at all—became possible with the invention of automatic controllers. Some of the earliest examples were float-operated level control, weight- or spring-loaded pressure relief valves, engine governors and on-off temperature controls. Controllers are now used to regulate a wide variety of process conditions: flow, pressure, temperature, level, dryness, density, thickness, pH and composition, to name just a few. The crucial elements in all such systems are means for measuring the condition to be controlled, comparing the measured value with a desired value, and taking action to bring the two values into agreement.

A major change in the operator's duties took place with the introduction of the automatic controller. Its use relieves the operator from the task of continually readjusting valves to counteract disturbances. As before, an important part of his job is still to look out for actual and imminent failures of process equipment and instruments. In addition, he is usually asked to keep a log of the process variables. Together with the process engineer, he must now decide how to set the various controllers. That is, they must decide what temperatures, pressures, flows, levels, and so on, should be maintained at various points in the process.

In the next stage, some of the operator's remaining jobs will be taken over by computers. To an even greater extent than he is today, the operator will become a supervisor of the process, relieved of routine chores so that he can devote his attention to exceptional events.



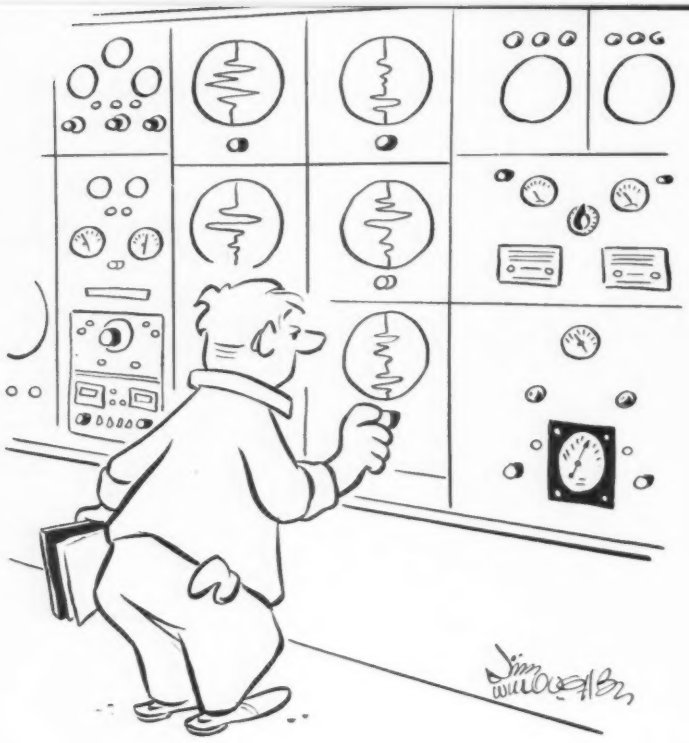
The Last Laboring Operator

What is a process control computer, and what will it do as a process control instrument? How is it better than the human operator? What is the justification for installing a computer?

A process control computer is a device which can (1) accept input signals corresponding to process conditions; (2) perform arithmetic computations (addition, subtraction, multiplication, division, etc.) using its input and other quantities supplied by the operator and process engineers; (3) make comparisons ("Is A larger than B?") and decisions; and (4) develop output signals for directing the process, informing the operator of abnormal conditions and recording data on process operation. When a digital computer is used, means are included for converting the input signals to digital form and reconverting the computed quantities back to analog form for connection to controllers and valves.

The process control computer will have a variety of assignments. Its most important job will be to determine and enforce the best conditions for process operation. In some chemical processes, for example, it is known that the best temperature at any particular time depends on the flow rate and composition of a feed material, the condition of the catalyst, the maximum tolerable amount of impurity in the product and other factors. By means of equations built into the computer by the system designers, the best temperature can be computed, checked to see that it lies in a permissible range and supplied as a set point to a temperature controller.

Because it continuously receives information from process instruments, the computer can generate a printed record or "log" of process



This Is More Like It

operation. This record can include not only instrument readings, but also such data as computed yields and catalyst activities for the process engineers or average and integrated flows for the accounting department.

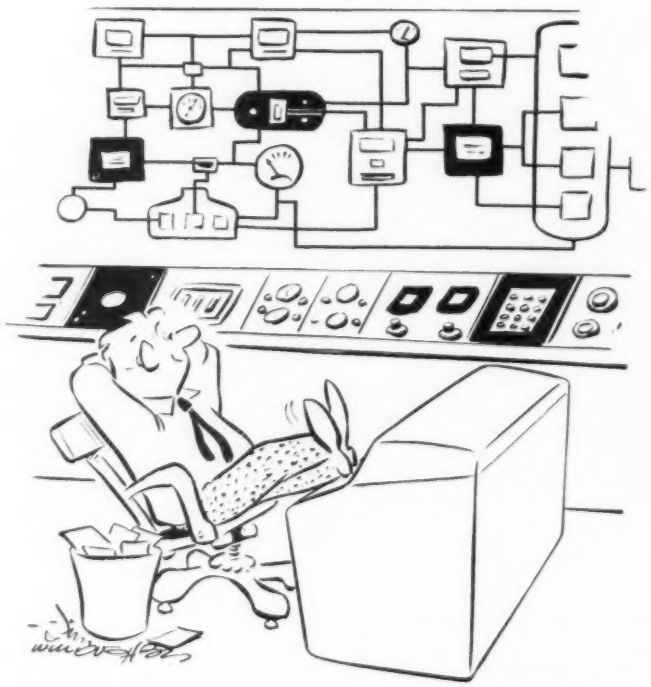
In addition, the computer can check instrument readings for indications of trouble in the process. These checks may consist of simple comparisons of individual variables against high and low limits or against past values (to detect hazardous trends or a total lack of variation which may indicate that the instrument has failed). It is also possible to compare values or rates of change of several different variables, the flows into and out of a vessel or the fuel rate and temperature in a heater (which should increase and decrease together).

A computer can be used to advantage if the process is so complex that an operator cannot comprehend and act correctly on the many variables in the time available. Some control calculations are too time-consuming to be performed manually, but can be done by a computer in time for the results to be meaningful. In other cases, the process may be so simple that the operator becomes bored and negligent. The ability of the computer to follow faithfully a specified set of rules makes is useful in these processes as well.

The real argument for installation of a computer control system, however, is economic. For processes that add sufficient value to the raw materials and have the complexity, it has been found that a computer can produce adequate dollar savings through improved product quality, increased production, or reduced material and utility costs. In such cases, the investment in a control computer can be justified on the same basis as any other kind of process improvement.

Nobody is yet envisioning a fifth stage in the evolution of process control, the fully automatic plant where —according to the joke—a telephone will be answered with the remark, "There's nobody here but us instruments." Although their duties will change, men will still be required to monitor operation of the process and its control system. Little reduction in operating manpower will be possible in plants that already use a high degree of automatic control. A number of new and challenging jobs will be created in the design and fabrication of the computer control system and its various component parts.

This Is the End



Savings in installation—

by eliminating long control circuit runs of pipe and wire

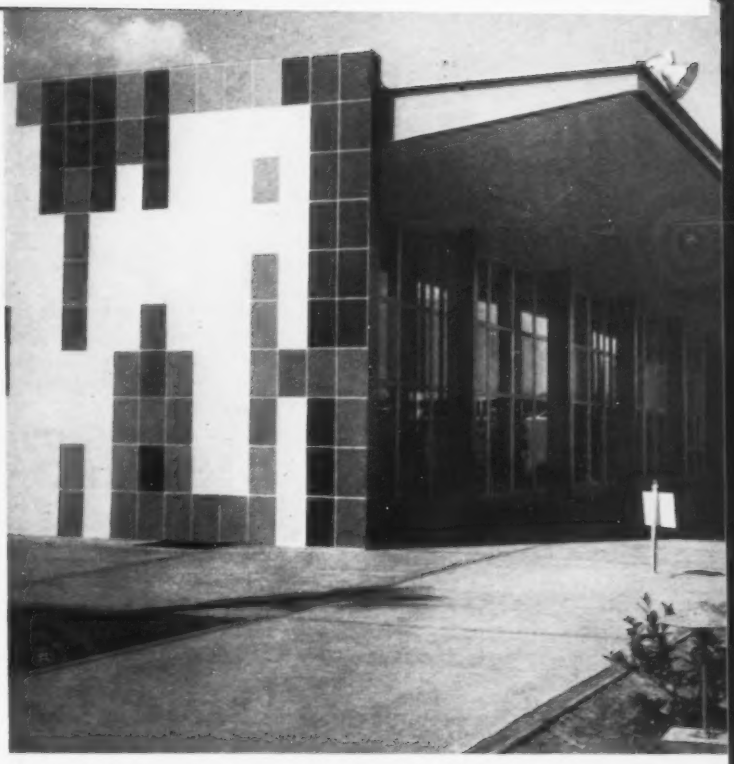
And in operation—

by controlling plant demand and waste of electricity, fuel or water

Later changes—

for control is possible anywhere on the wiring system

Such is—



IBM controls all outdoor flood, street and path lights with it

Control . . .

By Internal Carrier Current at IBM

Carrier current over a building's wiring system is used to actuate relays without the use of control wiring in one of today's newest automatic systems for use by business and industry. Such a method has been developed by International Business Machines and is called by it a "central operations control system."

It is applicable wherever commercial 60-cycle power is available and can provide as many as 40 on and off coded electrical impulses to every electrical outlet in the premises. By this means it is used to switch lighting circuits, motor circuits or to open and close valves. Thus it can handle automatically preprogrammed schedules for heating and air conditioning or lighting, both inside and outside a plant, as well as furnish an accurate timing system.

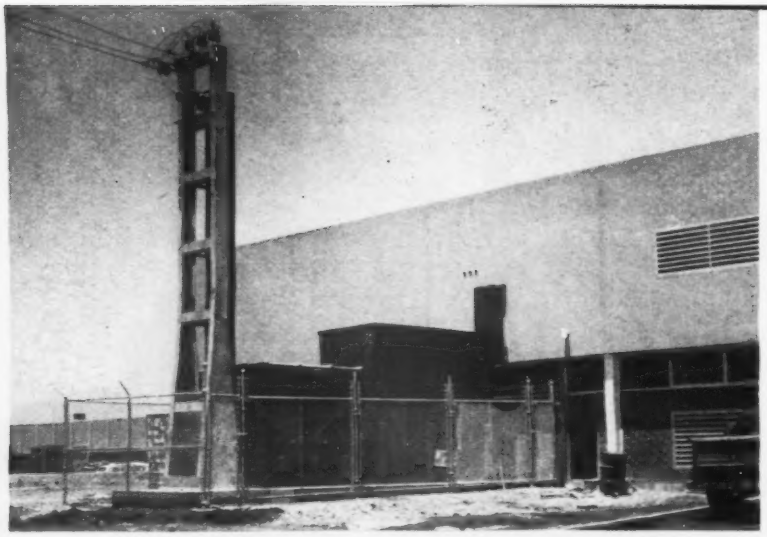
While installations in the West have only recently begun to be made, the IBM new plant at San Jose, making use of its own medicine, is an excellent example of its possibilities and applications. In its own plant IBM uses two different frequencies, one for its timing system, the other to control various utilities. Under the latter classification come the street lighting, the yard protection lighting, the air conditioning, the general illumination in the plant buildings, various motor operations, temperature change in manufacturing buildings during night shutoff. Its timing frequency will handle the starting and quitting time signals, coffee breaks and lunch periods, night shifts, time stamps, job recorders.

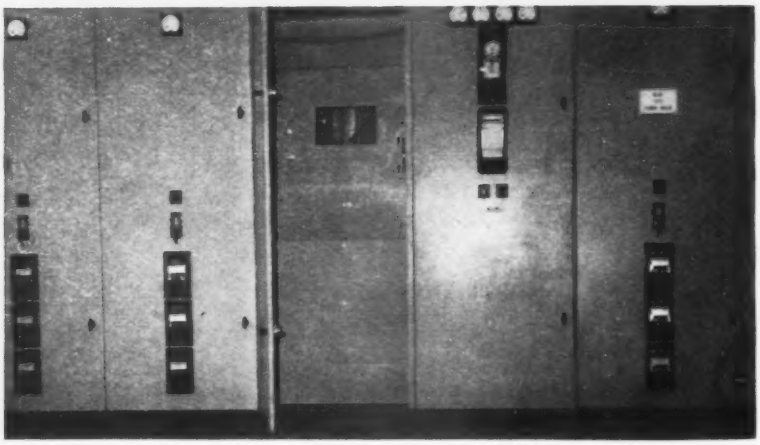
The time system works in conjunction with IBM's master time system that is radio supervised and synchronized automatically with broadcast signals sent out by the National Bureau of Standards on WWV, Washington, D. C., or WWVH, Hawaii. This equipment automatically seeks this signal once each hour or failing to receive it through interference or other causes, tries again every 10 minutes until accomplished. Overall accuracy within one second per day is thus maintained.

In the case of the IBM plant, spread out over 210 acres, the 12-kv line from PG and E comes overhead to a substation at the boiler house. It is inside this building that the carrier frequencies are imposed on the entire circuiting through the group of buildings. For a large distribution system of this kind motor-generator sets are used to provide the two frequencies. At this plant 2,925 cycles are used for the time system and 3,803 cycles for the utility relay system. These two frequencies are controlled by two master operations control panels that are set up to select the signals at their proper sequence.

It has been found that the best results are obtained when the frequencies are put on a line at the highest voltage point. One cubicle in the line of 12-kv switchgear receives the signal. It is introduced at this point in order that it may be imposed directly from the frequency generators on the floor below onto the 12-kv system. In the IBM plant a 40-hp motor drives two 15-kw generators to provide the frequencies.

In other words one "cannot go uphill" to higher voltages without dissipation of the signal. However, the signal is transmitted satisfactorily down through the various voltages





Wave trap units are in steel enclosure at center, on incoming 12-kv service before it enters boiler house from outdoor substation (top picture). Carrier frequency is imposed on entire plant distribution at the cubicle (door open) in the main entrance switchgear (above). It is generated by the two generators below, left. Enclosures facing them, on gutter (shown open at right) are dual frequency tuner, frequency interlock, dual frequency voltage regulator, dual frequency generator control unit, motor starter, small dual coded receiver

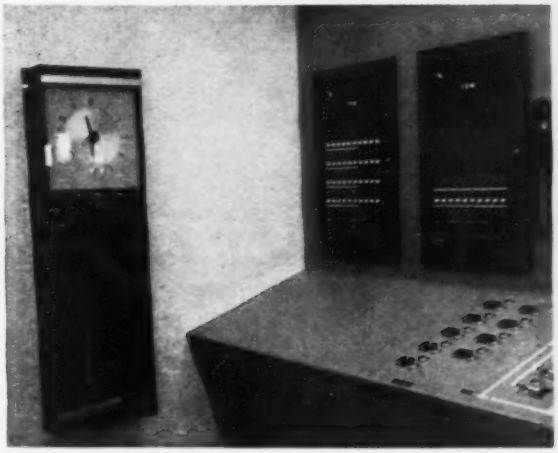
and through the transformations to the point of use.

For smaller installations the same principle holds. A building in which 480-v or even 240/120-v distribution is used could employ the system by imposing the higher frequencies at the highest point. In such case electronic means may be used to provide the signal generation rather than motor-generators.

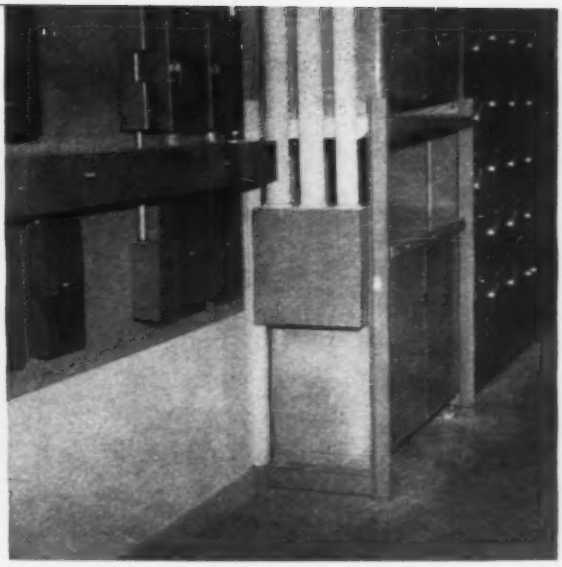
To keep the signal from going out over the power lines of the vicinity where it might operate other similar systems a reactor or wave trap is placed on the incoming 12,000-v line where it enters the plant. This device has inductance and capacitive reactance tuned to trap the high-frequency waves at that point.

The plant distribution system is a typical one for large plants of this type. It radiates from 17 load centers, 12-kv-480-v and 12-kv-120/208-v with capacities ranging mostly from 750 kva to 2,000 kva. From the load centers bus duct runs are fed throughout the main manufacturing buildings. Utility circuits for the building are normally 480-v but because the machines manufactured will be used on normal distribution voltages it is necessary to provide 120/208-v for testing as well as for power tools and other devices used in manufacture. Plant lighting is on 480/277 v.

The central operations control systems themselves are simple. They consist of a central operations panel, a transmitter and coded relays. Command signals initiated by the central operations panel through the transmitter are superimposed on the 60-cycle wiring. The coded relay at the operating end is an electronic and electromechanical device capable of



Master time clock and two central operation panels, one for each frequency, in the plant main control center room



Dual coded receivers and equipment starting relays, left, at a 12-kv-480-v substation with 480-v motor control panel

selecting any one of 40 "on" commands and 40 "off" commands.

The central operations panels contain an accurate master clock and program control. A hinged panel door holds cycle, circuit-selection and inactivating switches, pilot lights and a channel selector. Pilot lights indicate the on and off status of the circuits. Through the inactivating switches a manual control of the system is also provided.

Flexibility is afforded by use of pluggable relays and program machines that can be installed or changed quickly and easily. Schedules are changed in the programming drum-type units by inserting new schedule bars in the drum. As many as 10 on and off functions may be performed simultaneously. Where many motors are to be started, timing can be selected to step the starting so as not to impose too great a demand on the lines at the same time.

At the operating end dual coded relays are the remote control units that energize various types of motor starters, magnetic switches or valves. These relays consist of a electronic receiver and a decoding mechanism. These mechanisms distinguish between any one of 10 on and off codes on the same frequency.

Load and control switches are added for safety and convenience. The load switch serves to switch manually various operational units at the relay position. For example, lights may be switched on or off at times other than those programmed. The key-operated control switch is to render the line inoperative and prevent unauthorized switching. It can be locked out when work is to be done on the circuit.

With an available variety of relays of the latch, transfer, contactor type as well as those for actuating alternate wiring requiring heavier amperage, the control requirements of any installation can be handled.

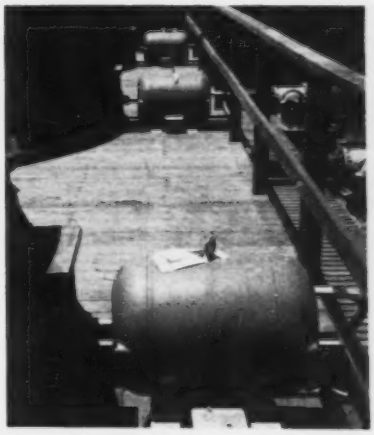
Economics of the use of the system depend upon its size. It may also be used in schools, commercial buildings and other installations other than industrial plants. In schools, for example, it could be used to flush urinals, control time, control outside protection lighting, control the turning on and off of the heating system.

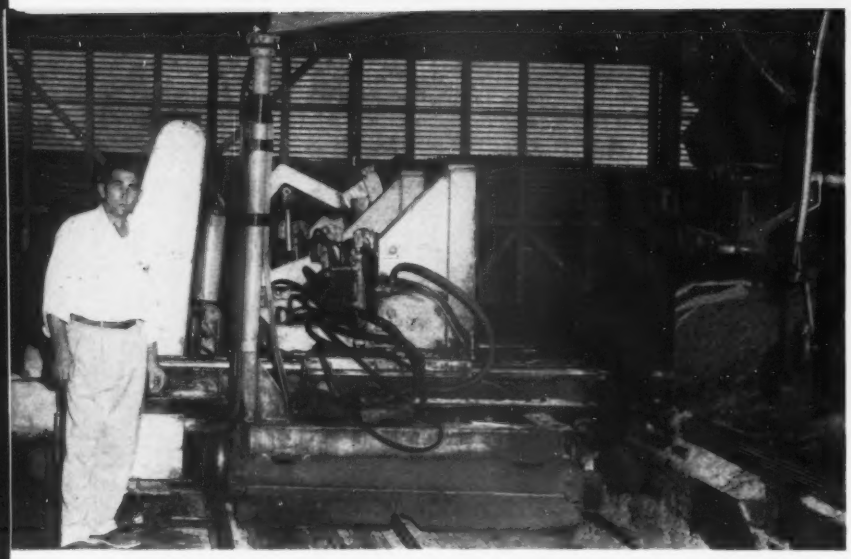
Savings in conduit and control circuit wiring in many cases can be substantial. Moreover, should the controlled equipment be moved the rewiring of control circuits is not required for the carrier wave will carry the controlling impulses wherever the equipment is relocated. Proper programming of operations can also make savings in demand from the power supply, as well as regulate use of lighting, water, fuel or other facilities automatically to result in economies.

Plugged to convenience outlet dual coded relay here controls time punch

Plant lighting remotely controlled through busway and lighting circuits

Motors such as air conditioning cooling tower fans will be controlled also



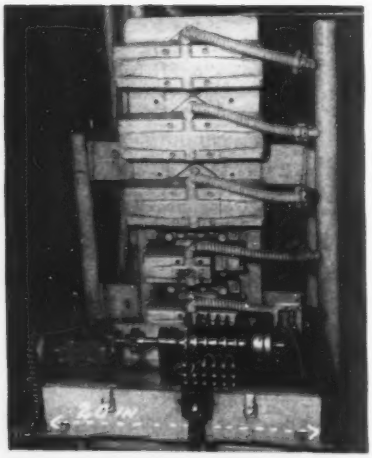


Walter LaCasse, assistant manager (left), stands by log carriage saw that is controlled by Walter Bigelow (above). Bigelow can select one of five automatic sets with the keyboard he is touching. Three lever functions and 36 electrical functions are at the sawyer's fingertips in 18 control circuits

Control . . .

A New Look in an Old Industry

Marlow Wall, Chief Electrician, Ivory Pine Co. of California, Dinuba, Calif.



The past three to five years have seen a remarkable change in the West's saw milling operations. Automation, with all of its advantages, has found and is continuing to find a wide acceptance in the lumber industry.

An outstanding example of this is in the saw mill of Ivory Pine Co. of California at Dinuba, where virtually every important operation has some controller device adapted to it for better economy, safety, improved product, or all three.

Photographs on these pages show the direct application of electrical controls as they take their place in the modern lumber industry.

Here are some of the general operation and maintenance features found throughout the plant.

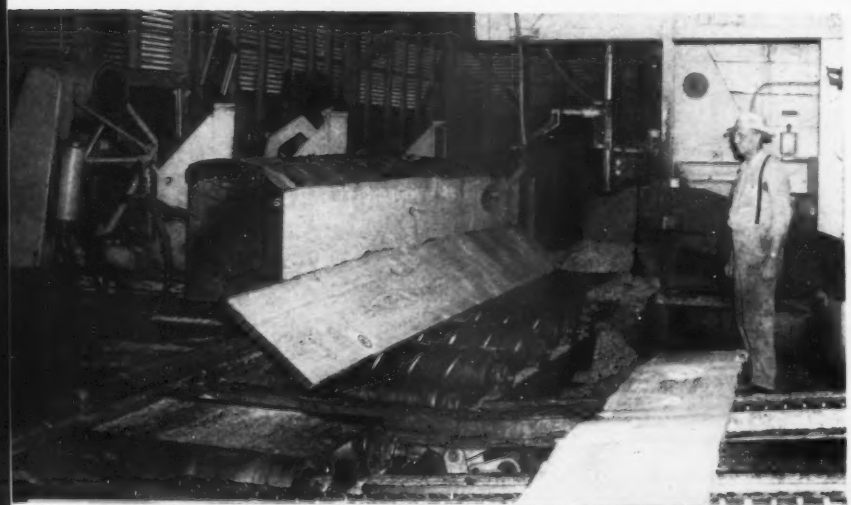
Control units, of course, are selected on the basis of operations. Replacements are made once a year, or before physical fatigue takes place, and at a time when production is not held up. All units are designed so that quick change is possible during regular run, with minimum down time. Multiple plug-in devices aid in this function. Labelling of units with numbers, letters, or complete wording, speeds maintenance.

Whenever possible, structure void spaces on gang motored machines are used for laying grouped wires for motors and controls, avoiding clumsy external gutters and conduits.

Test control power and throw-over switches with red indicating lights are provided for testing units of a circuit. Any remote motor control circuit on a keyboard is isolated by this throw-over switch when in TEST position for safety reasons.

Control power is taken through a 440-110-v transformer from the load side of an associated motor magnetic or disconnect.

Heating cable is attached to ex-



Mounted on carriage is the automatic set work control (left, above), that permits selective gaging of lumber thickness. Frocman D. C. McLean watches carriage in action. Dial in upper left corner indicates thickness saw is set for as log passes through

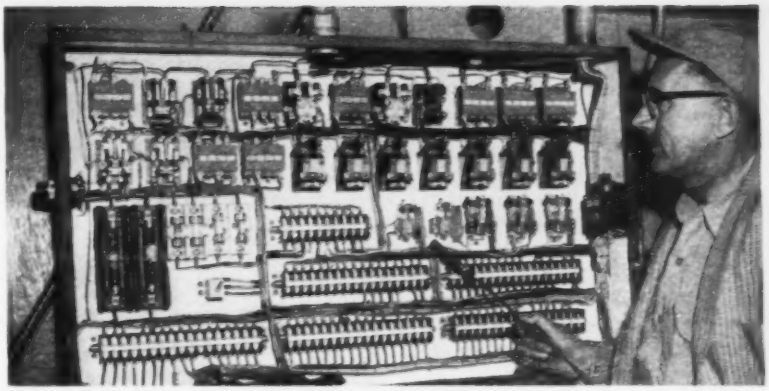
A touch of a key (above) causes the board to be cut into required widths. Operator has 32 functions controllable by the small keyboard. Some of them are positioning some are momentary and some are maintaining through notching and interlocking relays. Controls replace various preset devices here

posed electric solenoid air valves to offset the freezing effect of the exhaust air on the valve.

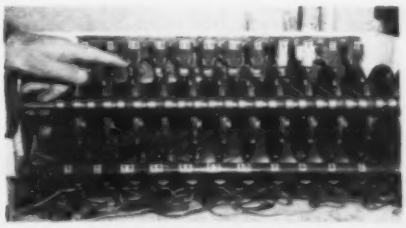
Other operations make use of knee-controlled limit switches, extended bat-handled lever control toggle switches and flush-with-floor switches. Touch or kick mushroom head switches are provided for ease of control in other places. Five sets of 480-v ground detector lights on two separate systems show slight or direct grounds that are cleared within four hours or sooner, because sections can be isolated during the lunch hour. It is also possible to determine immediately if a ground is on the set works of the riderless carriage, or any other critical equipment that might behave erratically if grounds occurred.

Ivory Pine's electrical system is ungrounded on the theory that a grounded system would lead to a build-up of many minor grounds and then a series of eating away of larger connections on devices. It is also important to the company to avoid small burn-outs that would occur before detection if a different method were used.

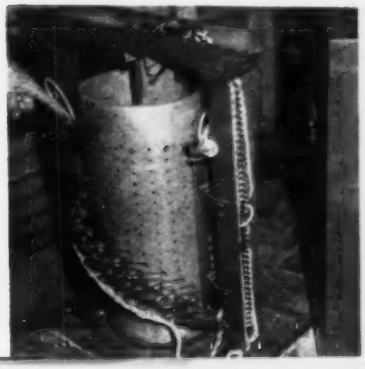
Follow the pictures to see the new look in saw mills.

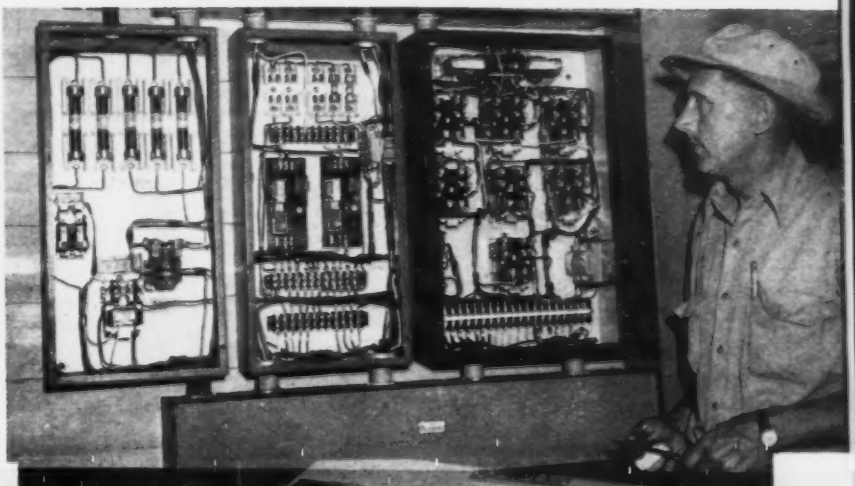


Marlow Wall, chief electrician and designer and builder of this electrical system, points to ratchet relays controlling chains of the trimmer. The trimmer control relays, center picture, is mounted on end of trimmer structure. Below (left) is the trimmer control keyboard. Next to it is the memory disk control box for the 11-saw trimmer



Sixteen-stage memory drum below is interlocked with grader chain. Wall is shown with relays controlling carriage functions





A single operator at this end of the automatic conveyor system controls everything but actual loading of cases on the pallets

Control . . .

Holds the Line on Product Costs

M. S. Rundel
Rundel Electric Co.
Millbrae, Calif.

Although the modern economy often seems to have the shape and general characteristics of a tornado, American industry deserves credit for defying the price spirals instead of running for the storm cellar.

Automation has proved to be an effective defense in such fields as manufacturing, assembling and packaging, helping to hold the price line on many consumer items as other elements of the economy are whirling upwards. The importance of this is illustrated by the fact that automation in itself is rapidly becoming a major industry—the molding of electrical and electronic products and technology into an efficient and reliable labor force.

Behind each product reaching the market are manufacturing, assembling, packaging, transportation, and warehousing. Of the five, warehousing has the greatest undeveloped potential for the application of the electrical labor force. So, as inflation continues to affect the economy, it is conceivable that many consumer products will bear nearly the same price tags because automatic warehousing can provide a cushion.

Several years ago, Rundel Electric Co., Millbrae, Calif., began to think of automatic warehousing as a tremendous potential market for control systems. However, the field of warehousing contains so many complex problems that development work had to wait for a specific warehouse application to present itself. It finally came from Gallo Wine Co., with specific warehousing requirements that consisted of assembly of orders from 1 to 200 cases of 70 types of wine. With a particular situation at hand that needed the benefit of automation, Rundel Electric teamed up with Matthews Conveyor Co. to produce the system.

Less than a year later, Rundel had completed the design and manufacture of a computor control console that operated conveyors and escapement devices to assemble outgoing orders. The final solution was one of apparent simplicity, and yet required many hundreds of hours of design time to produce a completely satisfactory order-filling machine. Basically, the system as installed, consists of storing each commodity on a long, slightly inclined section of roller conveyor. At the lower end of these conveyors is a belt conveyor. The cases are released onto the belt conveyor by solenoid actuated escapement devices. In order to increase production for the Gallo installation, three levels of roller and belt conveyors are coordinated. Orders are automatically consolidated on a single belt conveyor at the far end.

The operator sits at the computor control console with the day's orders in front of him. He enters the first complete order into the memory system of the control by pressing alternate switches indicating the quantity and the commodity of each item in the order. An automatic totalizer

indicates and checks the total quantity of cases entered. He then presses an order release button, which starts discharging the cases into each of the three levels of conveyors.

The memory unit in the console always rearranges the commodities so that those nearest to the exit end of the conveyor are released first. Each case is released when the computor control energizes a relay which, in turn, energizes the solenoid escapement device. A case clearing the escapement device interrupts a light beam to a photoelectric cell which releases the relay and de-energizes the solenoid. More signals for the same commodity will immediately release more cases until the desired quantity is on its way. The control then checks each conveyor line until it locates the next commodity to be released. With commodities being discharged simultaneously at three different levels, and with approximately three-quarters of a second for the release of each case, it is easy to understand how the system can assemble orders at a rate of 1,500 cases per hour.

As soon as the last case has been discharged onto the belt conveyor, the operator can immediately start entering a second order.

There are many other features built into the machine, such as a light indicating when one of the storage conveyor lines becomes empty. In this case, the quantity signals can be transferred to a second storage line of the same commodity by merely turning a selector switch, or if there is no additional storage lines, the shortage can be determined by pressing a toggle switch until the "Empty Line" light goes out. The operator may then read the shortage directly on a Veeder-Root counter.

The Savings

The result of installation of this automatic warehousing equipment has appreciably reduced the manpower and time to fill orders. The work of 20 to 30 warehousemen in three eight-hour shifts is being done with an average of three warehousemen using the order-filling machine three to four hours a day. Other important advantages are improved accuracy of the order filling, the ease of handling cases and reduced breakage.

What Can It Handle?

The system described so far lends itself particularly well to any product normally shipped in cases, bags or boxes. It is also adaptable to commodities shipped in bulk.

Many prospective customers have been discouraged from installing such a system because they have a large number of commodities. However, studies show that in many cases 80% of the order volume is represented by only 20% of the number of commodities. In such cases, the installation of automatic warehousing for only those commodities with a relatively high turnover is profitable. Additional commodities can be added to the automatic system whenever desired.

Hard To Maintain?

Some people have been deterred from the installation of automatic equipment for fear of high maintenance cost, but this concern is usually not justified. The computor control described here has standard heavy duty industrial-type components such as relays and contactors. All control functions have been divided into separate circuits that are mounted and wired on individual assemblies with a plug-in feature. Should maintenance eventually be required, a spare unit can be plugged in and the maintenance made on the old unit at the electrician's leisure.

There are no electronic parts except in the photoelectric relays. As a result, maintenance requirements are at an absolute minimum.

What Is Next?

The automatic warehouse equipment described here seems to approach the ultimate in order filling when orders are received by telephone and written down on a special form from which the order is manually billed. However, a number of improvements can be made to this system when other equipment is available.

For example, Rundel recently developed an improved order filling control for a customer who has automatic billing equipment. In this case, the automatic accounting equipment consists of IBM machines in which a card is "read" for each item of each commodity to make up the invoice automatically. The same group of cards can be "read" by the computor control console to fill the order without an operator.

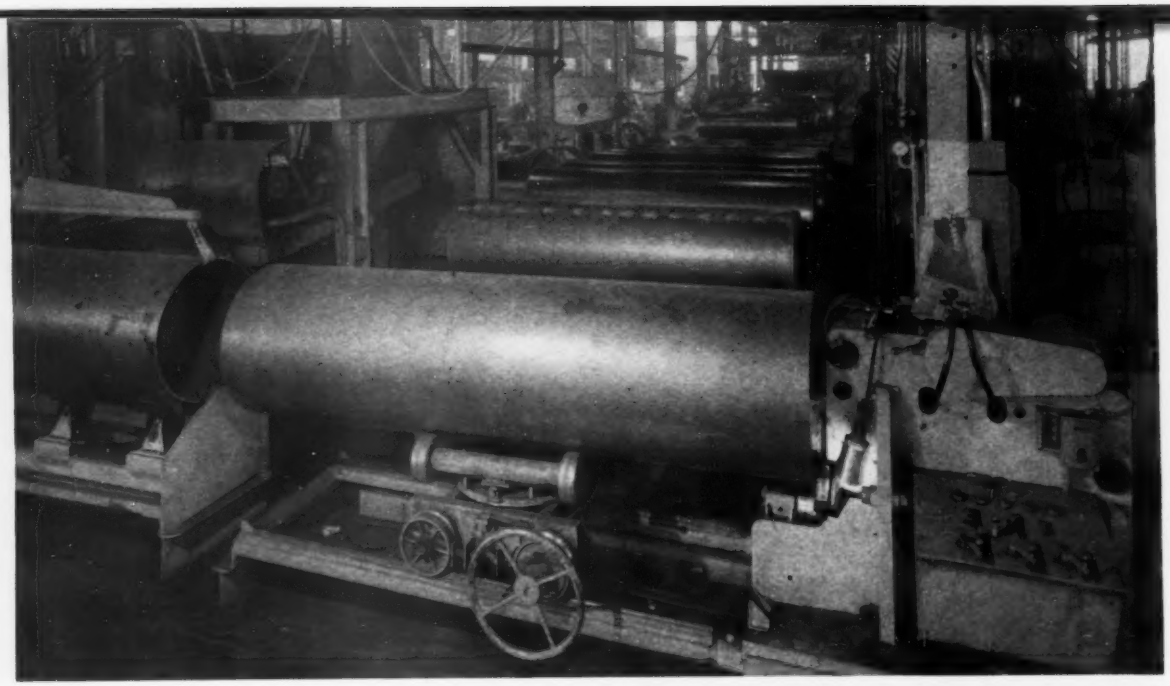
New tape accounting systems adapt themselves even more readily to basic order filling equipment.

There are other problems in automatic warehousing to be solved in the future. For instance, Rundel has been asked to develop a system that would work in the direct opposite of the Gallo system. In other words, the warehousemen want to feed a group of miscellaneous cases onto a single conveyor and have them identify themselves and be segregated by commodity onto separate conveyors. Equipment to perform this function will be available in the near future.

Many other operations in warehousing may be automated soon, and new ones will arise. Without a doubt the answers will be found and success will show in commodity prices.

This is the control console that relays type and quantity selections to solenoid devices

Escapement device releases case to conveyor

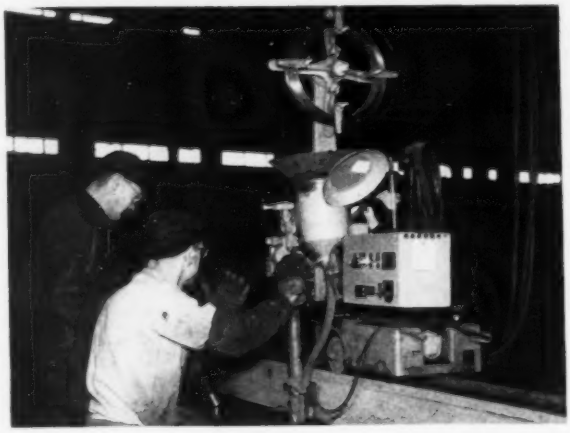


Scale and rust are removed here by speeding brushes, preparing the tank for automatic painting and welding phases of manufacture

Control . . .

Speeds Production

Electrical controls in the plant of the Lang Co. in Salt Lake City call signals for machinery that can turn out a propane tank in 15 minutes. Using automation to increase the output of the plant required the addition of a new 300-kva power center—an electrical labor force that teams up remarkably well with the 450 employees. The pictures give an idea of how it works.



After cleaning, the tank is carried on gravity conveyors to the point where interior and exterior tank seams will be welded by a submerged arc process welder (above). The tank then moves back to the gravity flow production line. Next step is a combination cutting and welding operation that adds pipe fittings to the tank (see arrow). An electrically operated tracing pattern guides this operation

After another trip on the gravity line, the tank arrives at the head pressing machine where elliptical heads are pressed on the ends of the shell. Automatically applied circumferential welds complete the tank (left). Fittings, gages and meters are installed next. Total elapsed time: 15 minutes

Control . . .

Builds Business

Ray O. Walker
Consultant, Business Development Department
Utah Power & Light Co.

● Automation opened up an entirely new business opportunity for Wheeler Machinery Co., Salt Lake City. The formula is quite simple: an automatic welder is so much more economical and dependable than hand processes that it is now cheaper to rebuild heavy track equipment components than it is to buy new replacements.

With the new automatic welder, Wheeler Machinery can apply 50 to 100 lb of welding rod in about four hours. Translated into manpower, this means that one man controlling the machine is doing a better job than three or four in the past.

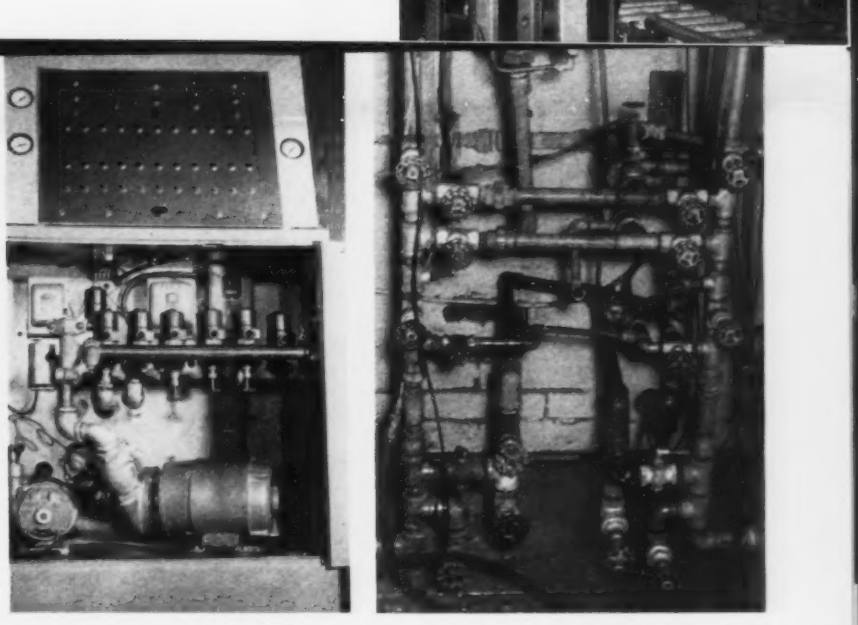
Automatic controlling is done by an L & B electronic motor control that functions efficiently with a line voltage from 105 to 125 v a-c, a frequency from 50 to 60 cycles, and at a primary current supply of 5 amp. The Thyratron tube governor puts out half-wave d-c pulse for the armature, and half-wave silicon rectified pulse for the field of the motor.

As the welder travels along, an electric eye "reads" black spots painted on the guide to operate or interrupt the welder. As the eye passes over the painted spots on the guide, a main relay is opened to stop welding, and when the eye again makes contact, the relay closes and the sequence is started. Actual starting of the arc is by a high-frequency neon transformer.

Two reels of welding rod are mounted above the control and feed down through the heads automatically. Flux feeding from two bins conceals the arc and makes a welding hood for the operator unnecessary.

The welding power supply is fed from two new Controlled Arc Power Supply three-phase welders. Input voltage is 208-230 or 460 a-c, 30 to 60 amp, 60 cycle. Output is 40-v, 500-amp d-c.

Application of the new process has turned slow business winter months into busy, profitable ones for this machinery company.



New controls at left replaced hodgepodge of valves, right, in soft water process plant

Control . . .

Aids Regeneration

Curtis B. Waite, Southern Nevada Power Co.

● Hand operation of soft water service regeneration plants is fast becoming a thing of the past.

Thanks to Pier Inc. (Precision Industrial Engineering & Research Inc.), a Nevada corporation, quality automatic controls at a reasonable purchase or lease price have now been perfected to do away with the old hand method of regenerating batches of home delivered water softening resins.

The present method of developing resin is dependent upon the attention of an attendant, who must at precise intervals open or close a maze of valves in order to send the solution through its necessary process. If exact timing or proper levels are not maintained, the batch is not uniform and a multitude of "hard calls" come in from housewives across town.

Due to complete supervision by the Pier system, a minimum of 50% savings can be realized in plant labor, an important item in overhead expenditures.

One small switch controlled by an office girl can begin the four-hour process, and built-in memories conduct an exact duplication.

The mechanism is designed primarily to lead the resin through a process to extract calcium and magnesium but, if so required, the system can be made to remove all injurious elements, too. An equal performance can be had from the use of any ion exchange material such as IR 120, Dowex 50 or Zeolite, through adjustments within the mechanism.

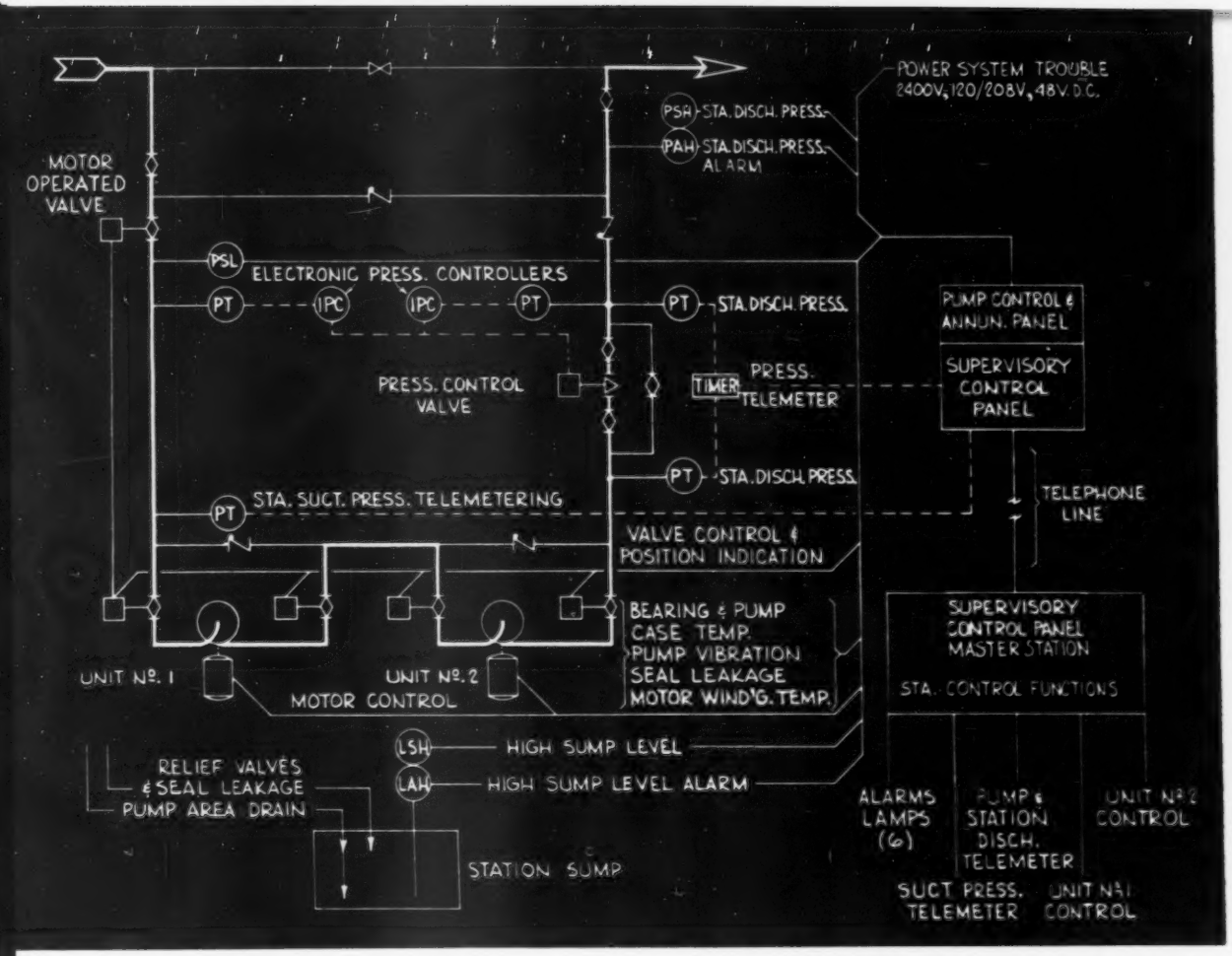
Although other companies are manufacturing automatic soft water systems, it is believed that this is the first to provide the greater flexibility and accuracy of control that makes a single unit applicable in any locality.

A remarkably compact unit, totally enclosed within a cabinet approximately 3 ft wide, 2 ft deep and 5 ft high, the "brain" quietly issues commands to equipment capable of conditioning water for the largest industry or regeneration facility.

Special savings realized from the application of Pier systems are:

1. A conservation of salt
2. Use of reclaimed brine
3. Consistency of product which reduces "hard calls" 85% to 90%
4. No need for special training to operate
5. Labor saving
6. Confidence in quality control

This means over-all better service, fewer complaints and more money at the end of the year.



This schematic diagram illustrates the remote-control system at work on a pipeline that reaches 700 miles from Salt Lake City

Control . . .

The Remote, Silent Sentry

J. L. Cunningham
Electrical Engineer
Standard Oil Company of California
Engineering Department, San Francisco

To most travelers driving to the north and west out of Salt Lake City into Idaho, eastern Oregon and Washington, there is little to mark the operation of one of the West's important transportation systems. An occasional right-of-way marker at highway crossings or perhaps a group of tanks at a take-off station or even less frequently a lonely pump station are the only outward signs of the Salt Lake Pipe Line Co.'s common carrier product pipe line system that stretches over 700 miles from Salt Lake City to Spokane.

Though unseen, the network of 6- and 8-in. pipe lines annually delivers millions of barrels of refined petroleum products throughout the Intermountain region. The scope of these operations has increased year after year and the remotely controlled unattended booster pump station, which may very well escape the notice of most passers-by, has assumed a major importance in today's operations. The evolution of these unattended pump stations and the design of the most recent installations is a story of interest to those in the electrical industry.

The Salt Lake Pipe Line Co. began its operations in 1950 with main pumping stations at Salt Lake City and Boise, and two intermediate booster stations. Subsequent expansion programs have seen the extension of the pipe line system from Pasco to Spokane, the laying of several hundred miles of additional parallel pipe lines, the repeated enlargement of the existing pumping facilities, and the addition of six more complete pump stations. By means of these programs, Salt Lake Pipe Line has been able to keep up with the requirements of all shippers in the Salt Lake City area.

At the present time, 10 pump stations are required to meet the maximum flow conditions. Seven are remotely controlled from the dispatching centers at Salt Lake City and Boise, with five of these unattended except for weekly inspection visits and the other two manned on a 40-hour-week basis.

The original two booster stations

installed by the company employed reciprocating main line pumps driven by forced-ventilated synchronous motors. Both boosters were designed for automatic operation; that is, they were to be started and stopped automatically as directed by the pipe line flow controllers. Provisions were also made for ultimate remote control. Subsequent experience with the reciprocating pumps and to a lesser extent with the synchronous motor controls, however, demonstrated that completely unattended operation would not be feasible at these two stations.

In 1953 the company installed its first station designed specifically for unattended remote operation. A centrifugal pump was chosen to minimize mechanical problems experienced with reciprocating units. A high-speed induction motor was selected as the driver to eliminate the need for ventilating equipment and to simplify control circuitry. Finally, a simple but somewhat limited device was developed to permit remote control over leased telephone lines.

The inherent simplicity of Huntington station, coupled with its increased reliability and, more important, its successful unattended operation, made possible a significant reduction in operating costs. Furthermore, Huntington station demonstrated that booster stations could be considered as a satisfactory and more economical alternate to "looping" or installing parallel pipe lines.

During the expansion ending last month, the Salt Lake Pipe line installed four new unattended stations patterned closely after the Huntington model. The over-all expansion program, which was supervised by the engineering department of the Standard Oil Co. of California, parent company of Salt Lake Pipe Line, included among other items the installation of a system-wide supervisory control network to control the operation of all booster stations from the dispatching centers at Salt Lake City and Boise. With this new system, pressures from all booster stations are brought into the dispatching stations and recorded continuously. Alarm conditions and automatic trouble shutdowns are signaled instantly and pumps may be controlled at will to meet changing shipping schedules, to minimize the system power consumption, or to balance pumping operations following an upset. With this equipment, the dispatcher can also diagnose trouble and send out appropriate repair crews within minutes after a shutdown.

The basic features of these remote stations and the dispatching station equipment is covered in succeeding paragraphs.

Station Design

All power and control components rely completely on electrical power for their operation. Instrument air for pressure control devices has been supplanted by electronic pressure controllers and electro hydraulic valve operators. As stated previously, the new booster stations have been patterned largely after the Huntington installation. Each has been designed to accommodate two horizontal centrifugal pumps. In most cases only the first pump has been installed, but basic piping conduit and control panel space have been provided for the second unit. The pumps and special dripproof induction motors rated from 900 to 1,000 hp have been installed outdoors under a shed-type roof and all major control equipment is housed in an adjacent unclassified control room.

Power Supplies

Three-phase, 60-cycle power for main pumping units is taken from local utilities at 2,400 v. Station controls are protected by a company-owned oil circuit breaker located at the utility's substation. Overcurrent, reverse-phase and current-balance relays and an emergency shutdown switch are provided to trip the station circuit breaker in the event of trouble.

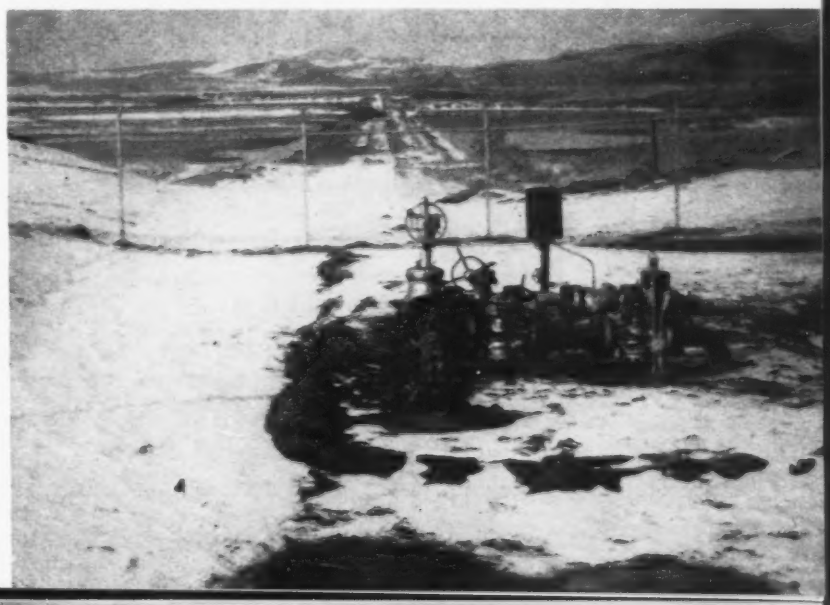
A separate 2,400-v—120/208-v, 30-kva transformer provides power for both lighting and operation of motor operated valves. This auxiliary transformer is connected ahead of the main station circuit breaker, not only to provide power for the operation of the oil circuit breaker but also to permit the sequencing equipment to close all motor operated valves and isolate the pumping equipment from the main line in the event of trouble.

In addition to these a-c power supplies, a 48-v d-c battery system with a floating-type battery charger is provided to insure proper operation of supervisory sequencing and protective relays at all times.

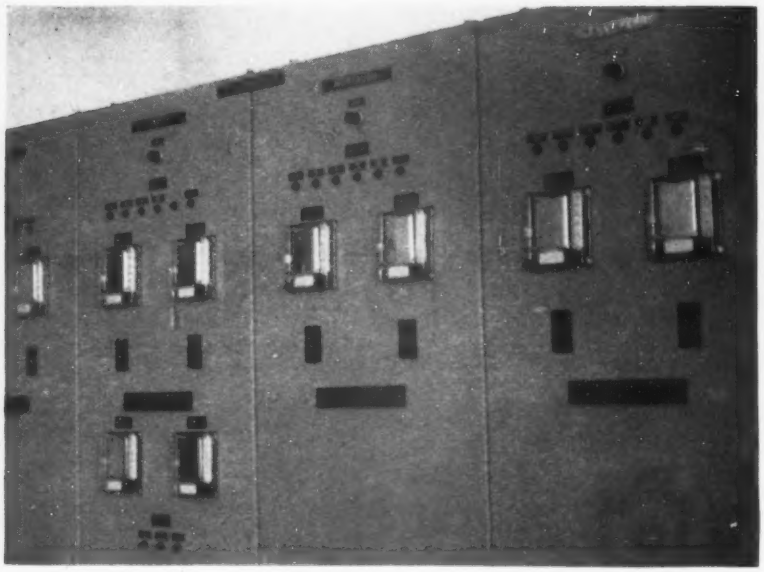
Modes of Control

Operation of the 2,300-v fused motor starters and of the 208-v motor operated valves is governed by sequencing equipment contained in a control panel at each remote station. A selector switch mounted on each pump control panel provides three modes of control. With the selector switch in "remote control," starting and stopping sequences may be initiated through the new supervisory control system from the dispatching station only. In "local control" the same sequences are employed, but local start and stop pushbuttons provide the primary control. The third switch position, "hand control," provides for manual operation of individual components by pushbuttons at each device.

Each device must be operated in its proper sequence, however, to prevent damage to equipment. For example, it would not be desirable to start the main pump without first opening the suction valves. With the exception of sequence checking devices, all alarms



Pipeline right-of-way stretches into desert



Main Panel—

and shutdowns are active in the "hand" position.

Control Sequences

Control of each pumping unit is completely automatic following the receipt of the appropriate signal from either the master station or the local control pushbuttons.

As soon as the dispatcher or local operator signals for starting, the pump sequencing equipment causes the station and the pump suction motor operated valves to open simultaneously. Approximately 35 seconds later, when both of these valves are completely opened, valve limit switches start the main motor driver. Auxiliary contacts on the main motor starter in turn initiate the opening of the pump discharge valve.

Since the motor brings the pump up to speed within four or five seconds and the discharge valve requires approximately 40 seconds to open, the pump is started under essentially blocked discharge conditions. The entire sequence from the starting of the suction valve to the full opening of the pump discharge valve requires about 75 seconds. It is monitored by a sequence timer that initiates the shutdown sequence and sends out an alarm indication if the startup is not completed in 90 seconds. Upon the receipt of this alarm, the dispatcher may attempt additional starts before dispatching a repair crew to the station. Dust or other foreign matter on relay contacts occasionally interferes with sequence startups, and repeated attempts are often successful in clearing this type of difficulty. Operators are cautioned, however, that no more than two or three attempts should be made to start the motor without allowing a cooling-off period for the motor rotor.

Following the receipt of a shutdown signal, the main motor is deenergized and both pump suction and discharge valves close simultaneously. The station suction valve remains open as long as there is one pump on the line and closes at the time that the second pump is shut down. Sequence checking timers are provided to monitor the shutdown cycle of each pump, and to initiate an alarm in the event the cycle is not completed within the prescribed time.

Effect of Power Failure

Utility power failures are perhaps the most frequent cause of unscheduled shutdowns. Since the motor cannot restart the pump with the discharge valve open, the sequencing controls are arranged to return the valves to the closed position as soon as power is restored. The dispatcher can restart the pumps remotely as soon as the indicating lights on the dispatching panel signal the restoration of power and the closure of all valves. Power failures during the starting or stopping sequences likewise initiate an automatic shutdown when power returns.

Loss of 120/208-v control power, however, is considerably more serious since the station can no longer operate its motor-operated valves. For this reason, control power failure has been made a station lockout shutdown, and a lockout release button must be operated at the remote station after control power is restored before the station can be operated remotely.

With the return of power and the release of the lockout relay, all valves close automatically, returning the station to the normal at-rest position.

In the event of trouble on the 48-v d-c system, voltage sensing relays send out an alarm and on a continued drop in voltage initiate the shutdown sequence and lockout the entire station.

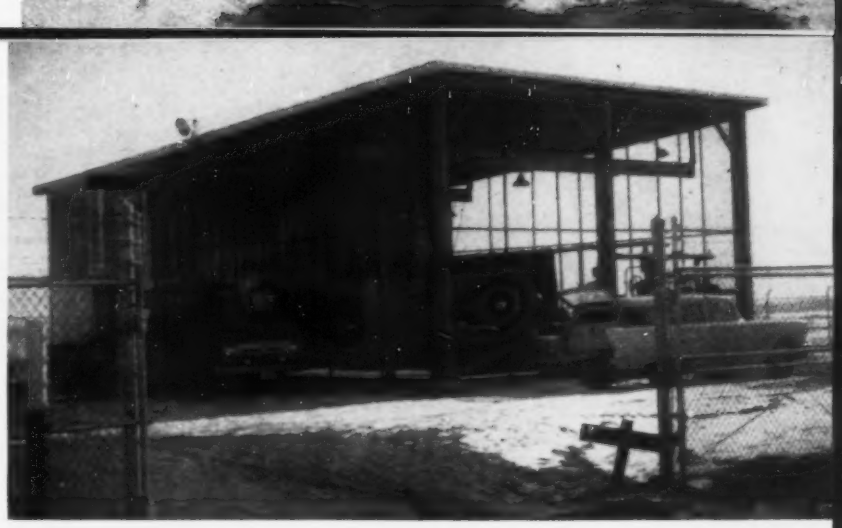
Automatic Shutdown Devices

All booster stations are designed to protect themselves automatically in the event of station trouble or abnormal pressure conditions in the pipeline. Protective devices not only initiate the pump or station shutdown sequence as required, but also actuate the appropriate station annunciator point and cause a signal to be sent to the master station identifying the cause of the shutdown. The table shows shutdowns and alarms provided at each station.

All lockout shutdowns require manual reset at the station after the source of the shutdown has been cor-

Nonlockout Station Shutdowns	Pump Lockout Shutdowns	Station Lockout Shutdowns
Utility power failure	Motor thermal overload	2,400-v circuit trouble or control power failure
Low station suction pressure	High temperature pump and motor bearings and pump case	Emergency manual shutdown
High station discharge pressure (alarm and shutdown)	High temperature motor windings	High sump level (alarm and shutdown)
High pump discharge pressure (where two pumps are installed)	Excessive mechanical seal leakage	
	Excessive pump vibration	
	Incomplete sequence	

- Five Stations



rected. Pump shutdowns do not affect the operation of the second pumping unit.

To protect against the hazard of line breaks and product leakage within the station proper in general, all small instrument lines at the new stations have been made as short as possible. Telemeter transmitters are located at the pipe connections, and all piping is braced securely to minimize vibration. Additionally, the area around the pump manifold has been drained to the station sump where high-level alarms and high-level shutdown devices warn the dispatcher when an abnormal amount of product is reaching the sump and that an automatic shutdown is impending. The sump level shutdown and, in fact, all station shutdowns cause the station suction valve located at the main pipe takeoff and all pump motor operated valves to close and isolate the station from the line.

Transmission of Data

Remote control and alarm signals and pressure telemetering impulses for all stations are carried over two four-wire voice quality leased telephone circuits. The various control signals are transmitted, received and decoded by a conventional supervisory control system employing pulse codes. One telephone circuit links the five stations between Salt Lake City and Boise to the Salt Lake City dispatching panel. The other circuit connects two booster stations north of Boise to the Boise dispatching panel. In both cases, separate audiotones are assigned to each station for the transmission of supervisory control functions. To conserve channel space, this same tone also carries the station suction impulse-duration telemetering signals at all times that control functions are not required. A second tone is assigned to each station to carry both the pump discharge and station discharge pressures on a shared-time basis. The two discharge pressures are recorded alternately on a single receiver at the dispatching panel. The station suction pressure has its own receiver.

Master Control Panel

In addition to the two miniature case pressure recorders, the master station control panels for each pump station include point selection and operating pushbuttons, a communication channel supervision lamp and individual alarm lamps to signal the following abnormal conditions at each controlled station: low suction pressure, high sump level and excessive mechanical seal leakage, lockout shutdown, power failure, high discharge pressure, and incomplete sequence.

Individual pump selection points are provided with red and green supervisory lamps to signal the condition of the pumping equipment. During the normal at-rest condition, the green supervisory lamp only is lighted. During the starting and stopping sequences, both the red and green lights are lighted. Only the red light shows during normal running conditions when a discharge valve is completely opened. In the event of trouble at one of the stations, the condition is signaled to the dispatcher by the flashing of the related alarm lamp and the sounding of the alarm bell. If a pump shutdown is also involved in this trouble sequence, the pump running lights indicate that such a shutdown is taking place by a flashing of both the red and green lights. Should several alarm conditions arise simultaneously at a remote station, the supervisory control equipment is able to store each alarm signal and transmit the information to the master panel in the order of its occurrence.

While thirteen to nineteen distinct shutdown or alarm contacts are provided at the new stations, only six alarms are transmitted to the master panel. This reduction in the number of alarm transmissions made possible a significant savings in the cost of the supervisory control equipment. It is felt that the particular combination of alarm indications chosen for the master panel will not greatly affect the operation of the system and that the dispatcher will be able to diagnose the probable source of trouble by noting the combination of alarm lamps, the condition of the pump supervisory lamps and pressure recordings, and take the proper remedial action.

The dispatcher may initiate control operations by pressing the appropriate point selection button on the dispatching panel. At most stations the starting or stopping of one or two pumps is the only form of remote control provided. At other stations, however, where the control of station suction or discharge pressure is important in reducing over-all power consumption, remote control of pressure controller set points is also provided. A control operation, be it start, stop, raise or lower, is performed by depressing the appropriate master control button after a white selection lamp on the control escutcheon comes on to indicate that the point selection has been completed. In the case of the remote set point adjustment, depressing the raise or lower button changes the pressure controller set point in increments of 1%. The proper operation of any control device is indicated by the red and green supervisory lamps in the case of pumping units, and by the telemetered pressures in the case of the remote set point adjustments.

The Next Step

The development of remote stations has progressed considerably in recent years but is by no means complete. Digital techniques similar to those used in process industries are being extended to pipeline control. Automatic read-out systems are already in use for telemetering pressure, flow, and tank levels and automatic digital telemetering techniques are also being employed.

Completely automatic dispatching systems are the next logical step in this development. While future developments offer great promise, remote controlled pump stations of today have made it possible for the petroleum industry to provide ever-increasing quantities of petroleum products at the lowest possible cost.

1—When and Where to Use

Grounding Transformers

Tom Hughes
Electrical Safety Engineer
California Division of Industrial Safety

Seven years ago, the electrical codes were expanded to permit the use of general lighting sources on 480-v power systems, with certain reservations and conditions. Like every new step in progress, this caused considerable apprehension in the minds of some observers and much confusion over the details of application.

Both electricians and inspectors were used to thinking in terms of three-phase systems for power and single-phase systems (with a neutral) for all the outlets down where the citizenry could fool with them. Now, we have another system in the plant or school, requiring another set of distribution panels and another network of raceways.

Rating of the switches or contactors was debated in meetings of electrical people, at first. It was decided that single-pole switches or relays (contained in their own individual case or arc-chute) could be chosen from those with a UL rating for 300 v (nominal 277) but the three-pole, branch disconnecting device must be rated for at least 500 v.

Another item which caused confusion in the minds of many was the requirement that the voltage-to-ground (of each phase) be not over 300 v. Everyone readily understood that this meant obtaining a neutral point in the system source, for grounding, but it was hard for some to picture two different ways of applying the system.

The requirement for not over 300 v to ground caused them to jump to the conclusion that the light sources could not operate at over 300 v, and that four wires would always be involved. As these systems are applied in the normal building, today, the light sources are nearly always fluorescent and their ballasts are standard at 277-v nominal rating.

If one desires to use 480-v ballasts (because of some special circumstances) they must be ordered special from the factory and a premium price is paid. However, standard 480-v ballasts for mercury vapor lamps (and some other special light sources) have been available for years and are used in "high-bay" lighting in large plants.

With such a system of lighting, the ballasts (or lamps) are connected directly across any two phase wires of the 480-v branch circuit and there is no reason for extending a neutral conductor from the system source to the loads. This seems to be understood by all, now, and there is no more confusion about the need of a neutral conductor. But, of course, the system must be grounded at the source by a "Wye point."

The logical users for the so-called "277-v lighting" system (at first) were the large plants which already had unit substations derived from Wye secondaries. There were no problems for them. In the last three or four years, however, manufacturers of various components have pushed the "277-v lighting" till it is showing up in schools, large markets and department stores, light industry, etc.

Advent of the Grounding Transformer

Naturally, such users are found in neighborhoods supplied from Delta secondaries and the problem of obtaining a neutral becomes a prime factor. The manufacturers of the components and sponsors of these systems solved this problem by applying grounding transformers in the particular plant of the user. Every one seemed to be going happily about his particular business till things started backfiring.

Suppose, for example, that you are running a small factory with 300 or 400 amp of load. For years you have been used to the fact that if a main fuse blew (at the service switch) you may have some partial "grounds" (high resistance or intermittent) on your system. But, out of a clear sky, one day things start happening to your service equipment.

You call the power company and, after a series of their "brains" have stood around your equipment and scratched their respective heads, you set them poking around your neighbor's premises. Finally, they replace their damaged metering equipment and help you decide what to do with your troubles and show you that it can be traced to a ground-fault in your plant. But they seem to be covering up something.

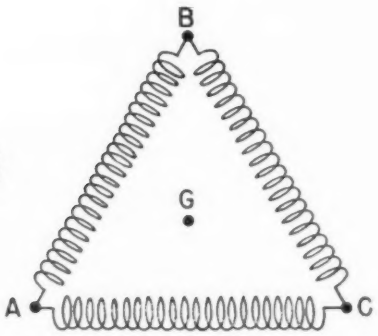


Fig. 1—Delta Winding

After much prying around, you uncover the fact that it is some equipment in your neighbor's old plant, or a new plant next door, that caused a change in the reactions of your system, after you had lived with it for several years and thought you knew all its foibles.

The facts of the case are that applying a grounding transformer on a secondary system presents many more variables than were recognized at first. Furthermore, the days of working out a grounding transformer installation with the supplier of this equipment are over. The power company is going to be very much in the act and you had better consult them first.

In order to understand the application of grounding transformers or the choice of transformers for a certain load we must first understand the purpose and the needs. Certainly, any reader of this article must be aware that 480-v three-phase service (or 240-v three-phase service) is usually furnished by the utility company from the secondary of a Delta-connected bank.

Some companies used to ground one corner of the Delta of a 480-v service but this practice has been almost universally discontinued. However, even if it were practiced, it would not provide the "voltage-to-ground" relation required by the codes for utilizing 480-v lighting. So we must do something to provide the so-called "star-voltage" relation, known, codewise, as the "phase-to-ground" or "line-to-neutral" voltage.

In Fig. 1, we see the simple geometric representation of the Delta-connected secondary winding of a three-phase power transformer. Assume that we bring three conductors

into the building from the three corners of the Delta (A, B, and C). We check the no-load voltage between conductors and find we have 480 v between any two of the three. By the definition of the codes, this is the voltage-to-ground of this system.

Now what we want is a voltage-to-ground of less than 300. We can see that, if we intentionally grounded the A corner of this Delta or a fault ground occurred on that phase, we would have 480 v from either B or C to ground. What we want is the star-voltage: line voltage divided by the square root of three (1.73). Just as the distance between A, B, and C must be equidistant, the distance from either one of them to the star point must be equidistant. So (in this geometric representation) we locate the star point at G.

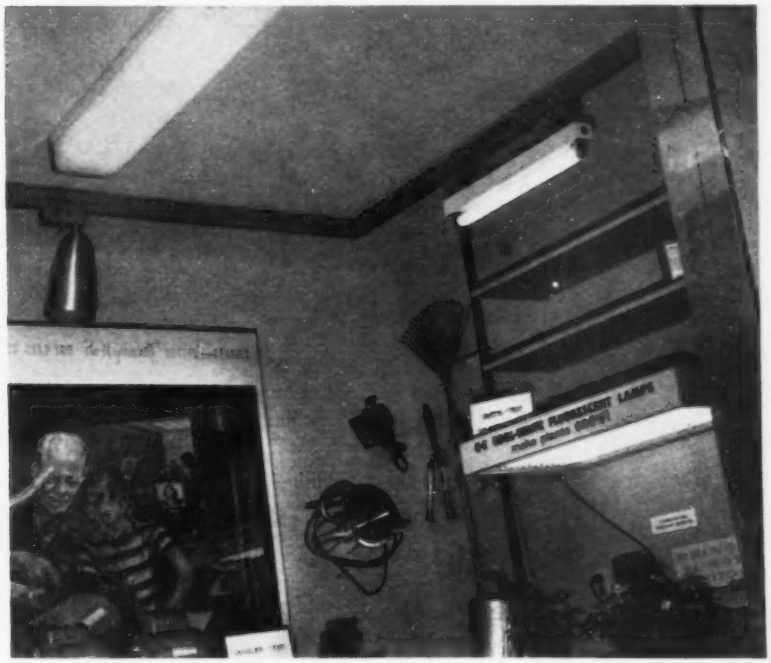
Connecting G to any one of the three corners of the Delta would cause no disturbance but, if we tried to connect it to any two of them, we know we would have fireworks. We could connect the corners to G through resistors but we would just set up a heating stove.

We might connect them through iron-cored chokes, that reacted to restrain flow of "steady-state" 60-cycle current. But this would not accomplish one of the important objectives envisioned by the code: that of maintaining the neutral at an equal voltage distance from all three phases.

With three separately acting chokes, any heavy fault could alter the balance of equal voltage spacing between the neutral and the three-phase wires. We would then have what the a-c system experts call a "displaced neutral." Under the right set of conditions we could even burn out the lights on one phase.

So, we have two things to accomplish if we successfully operate our system and satisfy the codes. We must obtain a star point for grounding and we must hold its voltage relation to the phase wires reasonably equal. Maintain a "stable neutral relation," as the experts say.

Next issue—How do we do it?



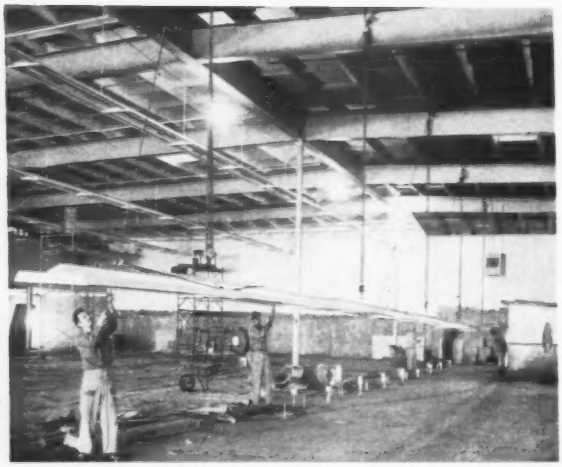
Lighting Ideas for Home Workshop

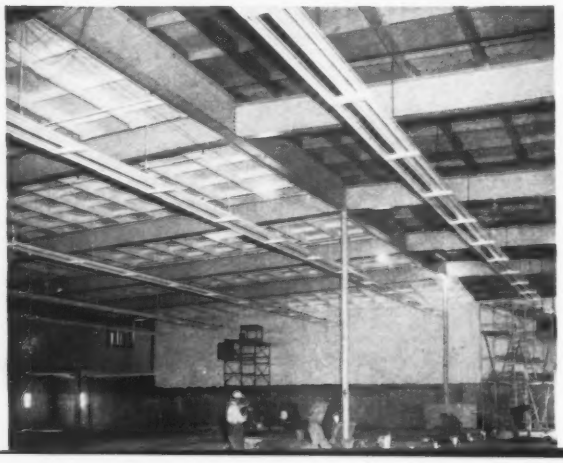
Planting ideas in the minds of the public as to uses of electrical service in a home is the purpose of such traveling show pieces as General Electric put on the road last year. In addition to all the appliance and residential lighting ideas employed to arouse the imagination and desire of the throngs that visited the display were these home workshop lighting ideas that may not have occurred to an electrical contractor he could sell many a proud new home owner. The louvered fluorescent unit for plant growth is one, but the idea of a run of trolley duct around the shop is special. From it any kind of light fixture can be hung or moved to where work is being done.

Mobile Job Shop

A shop on wheels has been used by Sam Franklin, electrical contractor of Paramount, near Los Angeles, with success in doing the wiring for tract homes. It is equipped with bins for materials, a work bench, a field office and it moves with the work so that his men can save time, which is costly, getting the materials they need. The truck can be locked and left at night or go back to the main shop to replenish supplies. It also carries labor saving tools. Note steps that roll with the truck when it is moved.

Preassembled Fixtures Save High Work





Lifting and hanging 64 ft of fluorescent fixture at a time was the way Schwartz & Lindheim applied both mass production and prefabrication techniques to a typical market lighting job. The steps of the operation by the Oakland electrical contractors are illustrated in the accompanying pictures. Both owners of the business being engineers they are known for ingenious application of industrial methods to their installations of lighting.

The installation pictured here was at the Town Market in Richmond, Calif. As in most such markets it was a large open area covered by a wooden roof supported on wooden beams supported in turn by steel girders. A single row of pipe supports runs down the center of the area. The ceiling height ranges from about 20 to 25 ft. It is illuminated by eight rows of fixtures having two rows of 8-ft slimline fluorescent lamps each in reflectors slotted at the top to permit upward light to the white painted finished ceiling.

Steps in the installation began with uncrating the fixtures and assembling a group of eight that would make up one continuous fixture. These are shown in the top picture. Also shown is one such long fixture assembly practically completely assembled on the floor. Along the top center channel containing ballasts and wiring a steel channel, such as Kindorf or Unistrut, is fastened.

The next picture shows the fixture and the steel channel ready to go on. The electrician makes all connections and even inserts the lamps while the fixture is on the floor. Rods that will support the channel and fixture from the ceiling are also fastened on and folded back along the fixture before it is lifted. These can be seen in the next picture where the 64-ft-long fixture assembly is being raised by five men with block and tackle temporarily fastened to the girders.

When pulled up to the level required, electricians working on top of a portable aluminum scaffold bolted the rods to the wooden ceiling joists. Electrical connection was made at the end of the fixture to conduit runs provided there in advance.

While the handling of so long a fixture in one piece required coordination and careful preparation, the method used proved much easier than lifting each 8-ft section the height required, supporting it in place and making connections and lamping so far from the floor. This method minimized the time in high work and increased safety for the electricians.

In other lighting installations the same contractors have used fork lift trucks to raise long sections of assembled fixtures to the mounting height desired. The first such job was described in ELECTRICAL WEST some years ago. A more recent installation at Northrup Aircraft Co. in Los Angeles, made use of fork lift also, with a long assembly rig made of Dexion perforated channel. It will be described in a later article.

Frank Johns, Jr. welcomed 250 customers at his Industrial Product Clinic at which Nick Beyer and others demonstrated

Stages Own Industry Clinic

Four desirable advantages were gained to reward Empire Supply Co. of Visalia for the careful planning and efficient execution of the first industrial product clinic in the mid-San Joaquin Valley. The work of its president, Frank E. Johns Jr., and his company brought an incredibly large audience of more than 250 picked executives and engineers to spend a Saturday learning of electrical and industrial products useful to their business.

The objectives, Johns explained, were attained. They were: (1) to get their customers to know Empire Supply better and be impressed with its physical facilities, quality of products, organization to serve them and sincere interest in their problems; (2) bring representatives of five manufacturers whose products it sells to meet these customers and discuss their particular problems and applications of equipment with them, also learn what was new; (3) give these manufacturers a chance to learn from the field any difficulties or misapplications; (4) make possible personal contact between all of Empire Supply's 14 people and all customers for better relations.

To bring 250 important customer contacts took planning. First came a carefully selected list of people, each of which was sent a personal invitation. It included a program for the clinic talks and demonstrations and a map showing how to reach the warehouse meeting place. Those invited included managers, purchasing agents, superintendents and chief engineers of dairy concerns, wineries, food processors, canners, irrigation districts, cold storage plants, packing houses, government facilities, city managers, school administrators, etc. In all 237 acceptances were received from 339 invitations to 182 firms of which 104 responded. (At the noon luncheon 275 were served a catered luncheon.)

Follow-up reminders were sent a week later and the five manufacturers participating were given a list and each of them also sent a letter at staggered intervals urging attendance. A final reminder was sent three days before the meeting.

The program was set up so that the three talks were given in the morning, with exhibit visiting time between each, and repeated after lunch so that late comers or those able only to come in the afternoon could hear and see them all.

Electrical participants in the program were Bussmann Mfg. Co., General Electric Lamp Division and Milwaukee Electric Tool Co. Nick S. Beyer, Bussmann district manager, San Francisco, gave a demonstration of fuse and motor overload protection.

J. W. Billings, manager, Pacific Sales District, G-E Lamp, Oakland, and E. P. Homer, district lighting engineer, showed light sources suited to industry. Robert W. Currie demonstrated Milwaukee electric tools.

Entire personnel of the company was on hand to act as hosts, including the wives of the executives. The management consists of Frank E. Johns Jr., president and general manager; James R. Millar, vice-president in charge of electrical sales; Frank E. Johns Sr., treasurer; and Emily E. Johns, secretary. The company serves an area in the San Joaquin Valley from the middle of the Fresno County to the middle of Kern County, including all of Kings and Tulare Counties. It is a distributor for electrical, plumbing and industrial supplies.

Chamberlain
Section Chairman

Ross
PG and E

Coatsworth
Edison Electric Institute

Hawley
PCEA President

PCEA Business Development Conference
Underscores President Hawley's statement that . . .

This is the Salesman's year

A resurgence of aggressive, creative salesmanship is at hand, judging from the complexion of the Business Development conference of the Pacific Coast Electrical Assn., held at the Statler Hotel in Los Angeles, March 6-7.

Largest attendance since World War II—325—turned out for the program planned by Section Chairman Clark Chamberlain and the guidance committee. Among so large a group there was difference of opinion, of course. But on one point there was a complete meeting of minds—the remedy for today's ills begins with prompt exit of the mere "order taker."

Content of the parallel sessions was varied to suit the divergent needs of the business group. Execution was in Clark Chamberlain style—meetings began on time and if some ended late that was because a thoughtful hard-working group of delegates wanted to get all the benefits of an exchange of ideas.

These thoughts, abstracted from some of the talks, seemed to be uppermost:

1. Let's be realistic in appraising today's business outlook.
2. Let's get back to creative selling.
3. Let's get on the all-electric bandwagon. This means electric heating and air conditioning. Load factor and costs must be considered but maybe they are not such prohibitive factors after all. Problems that exist today can very well disappear tomorrow.
4. Let's keep our allies and employees informed about our promotions, particularly our employees. A careless remark from a utility employee about, say, the cost of electric heating can be untrue and can undo a selling job.

While the program was too comprehensive to be covered in a report of this length, a sampling may show what the industry's salesmen are thinking and where they intend to go.

General Sessions

This is your year, PCEA President G. N. Hawley, San Diego Gas & Electric Co., declared in welcoming the sales group. Events have proved socio-economic planning and business manipulation by government are failures and we are looking to the salesman to drag the country back on its feet, he said.

With plenty of power and appliances to sell to customers able and willing to buy, there is no apparent shortage of anything in the electric industry today except *aggressive salesmanship,* James T. Coatsworth, commercial director, Edison Electric Institute, said at the opening general session. Among the things that are plentiful, he also listed competition, whose percentage drop in sales nationally is only about one half that being experienced in the electric appliance market.

The industry is at a time of golden opportunity, he said. If it is to take advantage of it, the job must be done with appliances on the market today; by careful planning, improving load-building machinery, rebuilding present-day sales forces and promotional programs, by launching new national efforts.

Implied was the hope that today's startling situation—a drop in rate of load growth in face of an all-time high in new capacity—would help clear one of the major hurdles—convincing management. "The complacency toward sales effort in the ranks of top utility management has been no myth," he declared.

Because both Paul D. Brooks, vice-president, American Gas & Electric Service Corp., and E. A. Snyder, man-

Quinton
Southern California Edison

ager of its sales division, were prevented from making the trip from New York, J. S. C. Ross, PG and E, read the paper describing their company's experience with electric heating and air conditioning.

Homes built without heat pumps or electric heating today will be obsolete tomorrow, Brooks predicts. This business potential goes way beyond the home, he said. The industry has a sleeping giant also in electric space heating for commercial and industrial customers. But the competition is active and the electric industry can't afford to sit around and wait, he warned.

American Gas & Electric began active promotion of this load in December 1953 on the basis of existing rates of its several operating companies. It has carried on intensive training programs, particularly among its own employees, and has a staff of heating and air conditioning specialists.

AGE makes only rough estimates on operating costs for space heating and is getting out of the engineering work on heat pump installations as dealers become qualified. It feels that layout and engineering are in the dealer's sphere.

The revenue story is good. During 1957 all-electric use in AGE homes averaged 19,126 kwh as compared with the system average residential use of 3,587 kwh. In the commercial and industrial market AGE sold 17,000 kw of electric heating last year. Older homes now account for 19% of the residential heating sales.

The real pay dirt is from the heat pump, Brooks believes. Today its installed cost in an average size home in AGE territory is $2,500 to $3,000 and Brooks looks for this to be cut in half shortly. "Not too far in the future your customers will be buying heat pumps just as they are buying air conditioning units in some parts of the country today," he predicted.

Ross commented that conservative estimate in PCEA territory shows in excess of 700,000 kw of electric resistance heating load plus 2,200 heat pumps.

Urging a realistic attitude, Harold Quinton, president of Southern California Edison Co., said the times call for more emphasis on dynamic promotion and salesmanship, not a sacrifice of those departments to economy. The postwar buyer's market, which resulted in a generation of ordertakers rather than salesmen, has been reversed, with a resulting need for leadership in developing creative selling, he pointed out.

We are not without challenge and opportunities, he said. Better bargains are being offered in the appliance market now than at any other time in history.

Agricultural Electrification

D. W. Struck, San Diego G&E, chairman
Harry Weingarten, Westinghouse, vice-chairman

The work done over the years by CREA to test the effectiveness of electrical applications on the farm was told by J. R. Tavernetti, agricultural engineering division, UC. The studies have been objective and aimed at showing (1) where other means will do a job better than electricity; (2) where electricity won't work; (3) the places where electricity does a better job. You can't just say an application won't work, you have to have the proof to back you up, Tavernetti said.

How a standard designed for street lighting can be used for security lighting on the farm, helping the customer and developing a favorable off-peak load, was told by Dean W. Morrill, Line Material Industries, McGraw-Edison Co.

Outdoor lighting on the farm is still manually controlled in most cases. From a safety and convenience standpoint it should come on automatically as daylight recedes, he said, and customers are willing to pay for that service.

Ohio Edison is promoting the L-M Suburbanaire to its farm customers and has installed 1,000 units in less than a year. It has established an experimental rate of $3 per month prorated for equipment and power. There is no charge for installation or maintenance.

F. C. Miramontes, PG and E, showed the set of slides his company has prepared to encourage those who can use sprinkler irrigation to do so. Slides rather than film were used on this educational job because they are more adaptable and can be selected to show soil conditions in specific counties. Importance of good engineering was stressed.

Residential Wiring

W. W. Bryan, General Electric, chairman
W. H. Abraham, PG and E, vice-chairman

National programs are making Housepower almost a household word, according to recognition and understanding studies. Pointing this out, Walter H. Abraham, PG and E, made these points about EEI's 1958 Plan of Action:

The industry should make its own people aware of the program and let its allies know. Everybody should be brought in because everybody can benefit — distributors, contractors, dealers. The local electric association can help with coordinated support.

The Western states are still underbuilt, according to Frank Falge, and this area probably will provide more Medallion Homes than the rest of the country, although interest is high nationally.

Citing the average of one buyer for every 536 visitors to a model home, Falge pointed to the "showcase" value in selling people who are looking for modernization ideas. Lighting too is important in the Medallion program, Falge said, and this may mean an extra $100 a home.

His company's stake in Housepower was told by Murray Owens Jr., Owens-Corning Fiberglas Corp. It is promoting full Housepower in its Comfort Conditioned Home pro-

"Whether we like it or not, the bare facts of the situation are simply this—that we in electric promotional work are presently poorly equipped to do a real hard-hitting selling job, the kind that was accomplished prior to World War II."—James T. Coatsworth, commercial director, EEI.

Duerst, Rome Cable — Lee, G-E — Bryan, G-E

Bethell, So. Calif. Ed. — Blair, G-E — Baker, Westinghouse

gram and will furnish certain materials free to model home builders.

Clyde Soden, Soden Wholesale Electric Co., urged manufacturer, utility and distributor to get together on a great selling campaign. The utility wants load, the manufacturer has the product, the distributor has the showroom and men with know-how, he said.

According to A. A. Gingell, Kaiser Aluminum & Chemical Sales, the small contractor is doing the bulk of rewiring in northern California. For the public to get a fair shake, there must be coordinated effort from all contractors, he believes. It boils down to an educational problem, a job of selling by communities. Rewiring is a big, profitable market and we must educate the large contractor on the amount that is available, he said.

Too many wiring programs are too rigidly tied in with *existing* load promotion patterns, H. H. Watson, General Electric Co., Bridgeport, warned. "Listen attentively to your wiring expert for he may be your best load builder for the future," he advised. Watson thinks we are about as far behind in residential wiring relatively as we were 25 years ago and now, just as then, a few courageous people will stand out for standards that seem far fetched but must be in place if the curve is to continue its steady progress. He took a look at the future in a paper that will be printed in part in a future issue.

Heating and Air Conditioning

J. T. Bethell, Southern California Edison, chairman
T. W. Fuller, PG and E, vice-chairman

In one of the liveliest sessions of the conference, this group heard the industry criticized (even called "stupid" by one speaker) and showed by its attitude that it really wants to know what its allies think about electric heating and air conditioning. A faulty air conditioning system in the meeting room punctuated remarks on importance of proper engineering and installation.

"Keep the gas line out of the house and you can't lose," was the advice of Paul D. Hawkins, general sales manager, Electromode Division, Commercial Controls Corp., New York. It is not easy to sell 200-amp service for appliances or heat alone but it is easy to sell the package to a customer who wants to live better electrically, he indicated.

What the all-electric home needs now is the industry's willingness to sell, Hawkins said. Load factor, costs, etc., will become minor, he believes. Average summer consumption in a home with electric heat is almost twice that of a home without it, he pointed out.

Heat pump and resistance heating manufacturers are not antagonistic, he feels, and the market for both will grow.

No matter how the pro and con balance sheet works out for air conditioning and electric heating, the two big deterrents to their greater use in schools are: (1) inefficient equipment and (2) cost, Charles D. Gibson, chief, Bureau of School Planning, State Department of Education, Sacramento, said in a talk that had complete attention.

Thermal factor in space design has not received the attention it should have in schools, Gibson said, because there has been no organized effort to bring together the professionals who must be responsible for improving the thermal environment in schools. "Our Bureau of School Planning tried to bring these professionals together several years ago but members of the industries and engineering groups involved failed to sustain our original effort."

Any system used to create and maintain a good thermal environment in a schoolroom must be capable of quickly warming the building in the morning in time for occupancy; it must provide sufficient heating or cooling to maintain the thermal environment during the day under the widely varying conditions of solar and internal gains and outside temperatures and exposures; it must reduce the temperature at night when the building is unoccupied; it should maintain even conditions in all parts of the schoolroom and take up as little floor or wall space as possible; should be noiseless and equipped with automatic controls.

Walter R. Hagedohm, AIA, said that architects are deluged with material but much of it is irrelevant. He would like to see thinking coordinated. Manufacturers can: (1) work on new ideas; (2) put local representative's name on literature ("where he *is*, not where he was six months ago"); (3) provide real cost setup including installation ("What good is cost of one section?"); (4) give firm delivery date on the article ordered, not "something just as good that can be delivered right away."

Architects are interested in meeting utility people and seeing what they have to offer, he said. "Architects are always willing to see people with new ideas. That's what we thrive on. We are looking for economy rather than just change." Standards change even from start of job to time contract is let. Utilities should work with the electrical engineer or the architect direct on heating and air conditioning specifications, he thinks.

At the afternoon session, the committee continued its "gloves off" attitude in a debate between advocates of central systems and individual room heating and cooling. Roy F. Carter, Westinghouse Electric, and Don Slack, General Electric, represented the former; Jack Beckett, Wesix Electric, and Herbert L.

Laube, president, Remington Corp., the latter.

Low air velocities of the central system enables it to provide proper air filtration and humidity control in a residence, according to Carter, who also cited the advantages of centralization of equipment in a remote space to isolate sound, vibration and maintenance. With proper design, well-balanced air circulation systems permit greatest flexibility in temperature control, Carter said.

To reduce spoilage, filtration and humidity control are important in commercial installations, Slack contended. Large-area low-velocity filters in big commercial equipment rooms increase the ability of the central system to filter and control humidity, he said.

Individual systems are ideal for combatting such design problems as inadequate duct room and lavish use of glass, Beckett said. Need for greater technical supervision on a centralized system than for unit installations because of need for precise balancing of air flows in the central system also was cited by Beckett.

Laube pointed to the easy installation of the individual unit in existing commercial and industrial buildings. He described a new package unit for perimeter areas. This system now combines a unit-type a-c compressor-condenser system with a hot water coil supplied from a central location. All controls, filtering and air mixing are self-contained. By replacing the water coil with electric resistance elements or converting to heat pump operation by suitable controls the unit could be adapted to complete packaging, Laube said.

Upward trend of alternate fuel prices puts electric heat in a favorable position, according to Bruce Fleming, vice-president, Edwin L. Wiegand Corp. Commercial and industrial customers also will be attracted by low first cost and maintenance of electric resistance heating, he said.

Power Utilization

W. E. Vaughn Jr., California Electric Power, chairman
C. C. Mak, PG and E, vice-chairman

Area development has grown very competitive, declared James Lee, manager of economics, Stanford Research Institute, South Pasadena. There are more sellers than buyers. He urged speedy removal of smog, congestion and other local annoyances and advised Western areas to program industrial development on a state level.

"The heat pump will not be developed overnight but it has a tremendous future provided we are willing to spend money and manpower to dig for the pay dirt."—Paul D. Brooks, vice-president, American Gas & Electric Service Corp.

Latest automation and instrumentation techniques can benefit existing industrial facilities, according to Tom Tracy, Minneapolis-Honeywell's West Coast supervisor of systems engineering. Those interested can keep abreast by studying industry magazines and manufacturers' literature, he said.

Efficiency of Edison's sales effort has been greatly increased by its group conference technique for selling power utilization ideas to commercial and industrial customers, according to John Parker of that company. The coffee-break conferences bring together customers, manufacturers, contractors, consultants and utility power salesmen. One of 17 subjects is considered at each meeting.

Leon Dame of Edison stressed the fact that the group conferences do not replace individual selling; that they supplemented it and make manhours go further. He said that prospects are developed so fast with this system that the conference schedule has to be spaced carefully to prevent overloading the power sales staff.

One warning was given, however. Detailed planning, including dry run, is mandatory because a poor conference can *lose* sales.

Commercial and Industrial Wiring

Frank K. Duerst, Rome Cable Corp., chairman
E. J. Stephens, Okonite Co., vice-chairman

John E. Roberts, director of planning for the city of Los Angeles, expressed the belief that, when studies define smog-producing characteristics of various enterprises, the city will be zoned to confine such activities to areas not conducive to propagation.

For the future he predicts that the Los Angeles area will be the hub for a continuous urban area extending 300 miles from Mexico to somewhere near Pismo Beach and inland about 300 miles to the high desert.

Almost any successful contractor can testify that the "sell down" approach eventually has its day of reckoning, declared D. L. Jackson, Vancott Electric Co., Los Angeles. "The man who thinks along these lines always seems to manage to sell down his own profits." Jackson believes that from now on there will be a great deal fewer excuses and a great deal more action on the part of this key figure on the selling team. His paper will be published later.

Increasingly concerned with fire probabilities from electrical cause, insurance rating bureaus will soon become one of the industry's best allies in adequate wiring promotion, R. E. Thomas, consulting engineer, predicted. Electrical causes are being charged with about 70,000 fires per year, with more than $81,000,000 loss annually. Thomas believes code enforcement is only a partial solution, that there must be adequate, not minimum, design.

A strong appeal to follow established industry standards for wiring and wiring systems was made by R. C. Graham, chief engineer, Rome Cable Corp., who reminded that they are based on good technical principles and, in the long run, mean reliability and economy.

He said that it is expected that there will be provision in the 1959 code, or possibly sooner by interim amendment, permitting more efficient use of conduit systems. It has been established that more than nine wires can be safely installed in conduits providing that in new wiring the interior conductor fill does not exceed 40% and that the current-carrying capacity of each conductor is suitably reduced as the number of conductors increase.

Industry standardization groups are working to establish proper ampacity ratings for the trough system and an application is pending for new code recognition of the cable trough wireway system, he said.

The bus-duct system has only recently come into its own, he reported, and a recent market survey indicates that it will have one of the fastest growths of all industrial wiring systems. A system that is gaining in popularity incorporates the enclosures and junctions of the bus duct system but with insulated cables replacing the bus structure itself, he said.

The new look in insulated wire products generally involves higher temperature ratings, which may or may not be discreet engineering

Vaughn, Calectric — Means, San Diego G&E — Struck, San Diego G&E

Black, Rome Cable

depending upon the evaluation of certain elements, he stated.

Home Economics

Mary K. Means, San Diego G&E, chairman
Edna Poyner, Norge, vice-chairman

With the largest attendance at the conference, this committee at one session has to move twice to larger quarters. It had top-flight speakers and a program of interest to the industry as a whole.

At an opening joint meeting with the Kitchen and Laundry committee, delegates discussed the important subject of placing, maintaining and replacing electric ranges in public schools.

Home economists as a whole felt that with today's burden on their department, they cannot take on the responsibility of promoting new or maintaining existing equipment. Representatives of merchandising utilities reported that they have no problem in getting good electrical equipment into schools; those from nonmerchandising utilities maintained that the responsibility for sales and maintenance of school equipment lies with the distributors. Although a subsidy program by utilities, manufacturers or distributors in competitive areas was discussed, no decision was reached.

At its first afternoon meeting, the Home Economics committee presented a panel, "My Most Successful Promotion." This included details of Maytag's Washerama, free washing promotion in dealer stores; Westinghouse Supply's electronic range promotion; Graybar's 13-weekend "locked in Sella-thon" for the Norge line; experience of G-E Appliance home economists with the Pillsbury contest; a laundry promotion by Edison that sold three automatic washers and eight dryers to an audience of 50.

Marguerite Fenner, PG and E, reported on the second annual Live Better *Electrically* Women's Conference in Chicago, attended by more than 300 from 33 states, the District of Columbia, Hawaii and Canada. Eagerness of this group to know how to tell the story of electrical living was attested, she said, when the audience "stayed with us even when the program ran overtime each day."

At the Home Economics Breakfast, Esther Foley, McFadden Publications, suggested ways of capitalizing on buying trends since appliances have stages of ownership that have nothing to do with their age. With small appliances, the industry should talk replacement, she thinks, because they are usually single-purchase items, with ownership beginning before marriage. The refrigerator, first major appliance a woman wants to own, is considered by her to be a once in a lifetime purchase; salesmen should talk in her language, largest, smallest, not in cubic feet. Laundry equipment, second in popularity, has a definite buying cycle, depending on family growth and need. Range ownership is delayed sometimes five to seven years after marriage and very little is being done to move up the desire for possession, she said.

"The times call for more emphasis on dynamic promotion and salesmanship . . . Better bargains are being offered in the appliance market now than at any other time in history."—Harold Quinton, president, Southern California Edison Co.

Kitchen and Laundry

W. T. Baker, Westinghouse, chairman
L. H. Shaff, Arizona PS, vice-chairman

Following its joint meeting with the home economists, this committee took up the problem of selling kitchen modernization to dealers. It was pointed out that redesign invariably leads to replacement of one or more kitchen appliances.

E. W. Meise, San Diego Gas & Electric and C. L. Neibel, Edison, discussed their kichen specialist programs to help dealers increase sales. Both companies sponsor occasional short courses for dealers interested in this type of promotion, with lectures covering kitchen layout, color styling, sales presentation, financing, contractor relationships, etc.

Following a rundown on the operations of a typical kitchen specialist, Neibel pointed out that he makes a good profit; that appliance dealers and department stores with full-fledged kitchen departments will usually admit that the kitchen department is more profitable, per dollar of gross volume, than other departments.

Commercial and Industrial Lighting

Frank B. Lee, G-E, Chairman
George M. Baker, Graybar, vice-chairman

Declaring that there is a direct relationship between the sale of lighting products and the extent of lighting education, J. D. Whitnell, Arizona Public Service, said this education is not being neglected but more is needed. The aspect that is being neglected this year, he believes, is the sales training area.

Color slides presented by S. O. Blois, PG and E showed a dozen recent installations, all well above lighting levels recommended by the various professional societies. This prompted the question in his title: "Is 100 Enough?"

A. E. Rowe, G-E, compared costs of certified and noncertified ballasts, concluding that, over the life of the fixture, the former are more economical.

Lighting trends were discussed by a panel including Whitnell; Bob Ford and Roy Bevanshines, Sylvania; Jim Grant, G-E. Delegates were told to watch for increasing use of 800-ma equipment in fluorescent fixtures both for commercial and industrial plants, that current investigations of the Research Institute may revolutionize lighting theory

and, at the very least, will have a dramatic effect on the industry; to keep posted on developments in electroluminescence, which may develop into a practical lighting source within five years.

Residential Lighting

J. C. Blair, G-E, Chairman
Leonard Komor, Sylvania, vice-chairman

Attention-getting titles in this section lived up to their promise in practical selling talk emphasizing that it is time to do the home lighting job.

"Who says we have no problems?" asked Robert P. Burbank, Edison, in urging his audience to live up to its responsibility to assume the leadership in residential lighting." When we are prepared to give our customers the help they need, we will have no problems."

Calling for cooperative programs that recognize the light-sight partnership, John R. Gorham, O.D., told how the Optometric Assn. and PCEA could expand good lighting practice. He advised more speaking engagements; reception rooms that are models of good lighting; making optometrists more expert in the lighting field; literature extolling the light-sight partnership.

"Seeing is believing," said Walter Lind, PG and E. Since cost prohibits lighting demonstration in the home, the answer lies in part in the model home, he pointed out. Describing PG and E's successful builder promotion of adequate lighting and wiring, he added that the model home is not "all a bed of roses"—it takes a lot of work by the utility salesman. There is still a selling job to be done to get complete industry cooperation, he said.

"How can we say the price is right when the budget fixture retails for $2.40 and the imported creation for $187.50?" asked A. O. Grotenhuis, Thomas Industries. What *is* right is the time, he thinks. The builder wants to glamorize his home and the people want styling and beauty; price is often secondary.

We're selling what we used to try to give away—residential lighting service, A. J. McCutcheon, San Diego Gas & Electric, told the group. We have changed the approach and our men are now welcomed—in fact in demand, he said.

Reminding that the auto has 24 bulbs and the average home, 11, Les Waggoner, Arizona Public Service, stated that the portable lamp business can be made the cornerstone of the residential lighting business.

Principals at the San Diego Bureau's winter conference, from left: John Otter, Philco Corp. vice-president; E. D. Sherwin, San Diego G&E president; J. Clark Chamberlain, bureau secretary-manager; Sam L. Hall, bureau president. Speakers believe that for the aggressive dealer . . .

The Future Looks Good

The appliance industry is taking steps to straighten out a bad situation caused by unscrupulous discounters, John M. Otter, executive vice-president of Philco Corp., told 500 appliance dealers attending the recent annual winter conference of the San Diego County Bureau of Home Appliances. "You have a bad situation that has spread from Los Angeles," he said, "and steps are being taken to straighten it out."

Ralph J. Phillips, vice-president, San Diego Gas & Electric Co., was general chairman.

Other industry speaker on the program was Frank Falge, Western regional manager, Live Better . . . Electrically, who awarded to Rorex Homes the first Gold Medallion in the San Diego area.

Otter said there were two kinds of discounters—the price cutter, who eventually drives himself out of business, and the smart businessman. "You can learn from the successful discounters," he said, "that there is no such thing left as a retail price."

He believes the biggest problem in the appliance industry is to get dealers excited. The future is open to very dealer who is aggressive, he pointed out, urging them to follow the lead of successful discounters in merchandising and sales methods.

On other subjects involving the electrical and appliance industries, Otter made these comments:

Manufacturing—It is a repetition of the late 20s and 30s. There won't be many more changes in manufacturers. Those in business will be in business to stay for some time. Industry has tremendous research plans to produce appliances for dealers to sell.

Hi-Fi—This is the instrument of the future. Dealers should get on the bandwagon. There will be a bigger increase here than in any other major electronic appliance in the next 10 years.

Refrigerators—There was a lull in refrigerator sales last year because manufacturers let the dealers down. There is a promise of tremendous new things from the laboratories. All appliances have a tremendous future.

Distribution—The big problem is final consumer cost. Business costs are up. Direct selling to dealers is not completely practical. Philco is experimenting with a distribution center to reduce costs. Initial reaction is encouraging.

An hour-long panel on San Diego's economic prospects for 1958 preceded Otter's talk. Participants expressed a cautious optimism.

San Diego winners in the International Lighting Competition received their awards from Emery Sherwin, president, San Diego Gas & Electric Co. First place went to Bob Huff, San Diego Gas & Electric Co., in the commercial division; third in industrial division to Al Schramm, Coast Electric; and third in industrial to Joe Burkhart, Chula Vista Electric.

Bob Lemman and Captain Steve Sanislo

Seattle Electrical Show

Proves Industry Teamwork

Bigger success than anyone even hoped was the verdict for the first Pacific Northwest Electrical Industry Exposition, held the last of National Electrical Week, Feb. 14-16, at Seattle Civic Auditorium. Not only were the 177 display booths of manufacturers constantly crowded by the 7,500 actually counted invited guests, but the entire electrical industry of the area coordinated its meetings and affairs with an unprecedented unity.

Sponsored by the Puget Sound Electric League (formerly Washington Electric Club) it had the support and participation of National Association of Electrical Distributors, National Electrical Contractors Assn., International Association of Electrical Inspectors, National Industrial Service Assn., Washington Electrical Contractors Assn., and Washington Electrical Council. NAED held its area meeting during the show. District 6 NECA officers and chapter managers held a conference and then a dinner dance during the show period. IAEI Puget Sound Chapter held a meeting. NISA and NECA had booths, as did IAEI and IBEW, and the two utilities, Seattle City Light and Puget Sound Power & Light.

Rather than compete with the manufacturers with product booths of their own the distributors did a novel thing. They had four spaces and kept there a "manpower pool" of NAED members from which help was given to manufacturers in the manning of their exhibits and to provide them relief for meals and rest. Participating companies were Love Electric, Demick Electric, Bean Electric, Home Electric, Palmer Electric, Graybar Electric, General Electric Supply, North Coast Electric and Westinghouse Electric Supply.

Because of the coincident meetings, attendance came from as far north as Alaska, east as Montana and Alberta, south as far as Eugene. It was a show for the trade only, and attendance was by invitation. Exhibits were restricted to the apparatus and supplies field, the only appliances being built-in heaters, fans, and the like.

Seattle's Fire Department Captain Stephen E. Sanislo, who originated the idea of a National Electric Week and fought inertia through the years until he finally saw it realized, was honored at the exposition for his pioneering. Responsible for the show's success were hard working committeemen, headed by Robert L. Lemman, Line Material Industries, league president and show general chairman. Others of his committee were Jim Hartwig, North Coast Electric, exhibits; David E. Edwards, Seattle City Light, secretary; Howard E. Bayley, Industrial Electric Co., finance; A. J. Flechsig, Wesco, minutes and records; G. A. O'Brien, Phelps Corp., industrial relations; Ralph Neilson, Washington Electrical Contractors Assn., attendance; W. C. Schafer, Crouse-Hinds Co., publicity; Bert Thompson, Organization Service Bureau, exposition manager; John M. Daniel, Square D Co., manager's aide.

Typical action at the 177 display booths of Seattle's electrical show for the trade

Associations, such as NECA, joined in. Doris Woodman of NECA and Beryl Ash

Problems of Management—IV

How to Delegate Authority

Dr. Joseph G. Phelan, Ph.D.
Personnel Development Counselor, Bechtel Corp.

The general has fought the battle before the first shot is fired. He has made his plans, issued his orders and the result is up to his subordinates. At zero hour, the general has completely delegated his authority and all he can do is to await results—and then plan and delegate again. He retains control and the full responsibility—but the success of the whole operation depends completely on how well subordinate elements do their job.

There are few executives who have to operate their business along strictly military lines. But the successful ones do approach this concept. Numerous studies of executive practices reveal that, among the causes of executive failure, the inability to delegate is practically always given top billing. It is rated as a more frequent cause of management failure than "lack of knowledge of the job" or "lack of breadth of vision" or "difficulty in making decisions."

Sometimes the delegating problem pops up in other guises in these analyses of executive procedure. For example, in answering questionnaires company presidents often say that an executive failed because of "not cooperating with others" or "being unfamiliar with the principles of organization." These are only other ways of saying that he failed to delegate properly.

Studies of the engineer as a manager hit upon the same point equally hard. Critics allege that the engineer, turned manager, goes right on trying to do everything himself. This is the sure way of putting the brakes on any organization. It seems to be particularly true of engineering managers that they find it difficult to give up knowing all about everything that goes on in a given department or section. They seem to back away from trusting subordinates and letting them go "on their own."

The much quoted formula for managerial success is: (1) analyze; (2) organize; (3) deputize; (4) supervise.

That formula says much in four words. The big question is how to do it. The last two words, deputize and supervise, mean actually delegation and control.

Dr. Earl Brooks of the New York State School of Industrial and Labor Relations at Cornell University made a study in which 96 executives were rated by their immediate superiors as well as by their subordinates. Here is a profile of the way the "excellent" executives handled their jobs. (The items marked with an asterisk are ones which rate high in the delegating process.)

a. They let workers share in making decisions*
b. They coordinated the activities of their subordinates*
c. They made full use of skills and abilities of their subordinates*
d. They let workers know what they were doing
e. They saw that the authority of each subordinate was clearly understood*
f. They kept workers informed of activities of other departments
g. They encouraged workers to exchange information
h. They knew how well workers and subordinates were doing*
i. They encouraged juniors to express their ideas and opinions
j. They selected the right person for the job*

The manager who gives his subordinates information and experience in decision making is training them to exercise good judgment and preparing them for a wider latitude of independent action.

Social scientists agree that effective delegation boils down to letting subordinates make decisions. Stated another way, Donald K. David, who became dean of the Harvard Graduate School of Business, said, "Delegation and control are the principal functions for the development of the greatest effectiveness of the management team." The top-flight executive delegates as much of his work as possible in order to leave himself free for analyzing and planning for the future. He first must analyze his own job to determine just how much of his routine operations can be delegated to competent subordinates. Then he must go about delegating these duties in a way that will enable the subordinate to get them done to his satisfaction.

When you give a man new responsibility you must also do it in a way that will make it possible for him to accomplish what you want him to do. This involves at least eight steps.

1. **You must give him the facts**—a clear picture of what he is to do, how much authority he has to get it done and, if necessary, suggest possible alternative ways that have been successful or unsuccessful in the past. Letting him have the value of your experience will help orient him in his new position. Above all don't let him be put in a position of being able to say, "Well, you never told me."

2. **You must define the scope of the job.** Specify the nature of the duties or authority that you are delegating. This is essential to keep your man on the right track or he may think you're handing him over your job. He should know what the limitations are in order that friction will not be created in his and other departments.

3. **You must acquaint him with the people with whom he has to deal.** If an assignment will bring him in contact with new people, for instance, men in other departments, introduce him in these places yourself and be sure to let everybody involved know they are to deal with your subordinate.

4. **You must specify the importance of the job.** An appreciation, by your subordinate, of the importance of the job and its relationship to the over-all operation is essential. Otherwise, obscure relationships surely will cause trouble.

5. **You must coach him a little**—prepare him psychologically for the new responsibilities. The man you select might feel subconsciously that the job was too big for him to handle. You can remove and ease tension by showing your confidence in

Check Your Score on Test, Page 16

All the answers are false except 6.

SECTIONAL pres-SURE-blocks
(for #22 thru #4 wire-750 volts)
Medium Duty:
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Heavy Duty:
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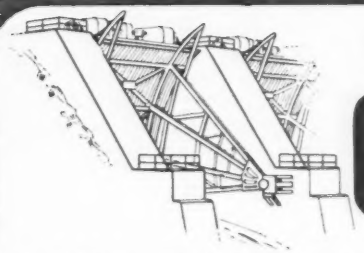

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his ability and reassuring him from time to time. Be sure and emphasize that you are available for consultation whenever he is in doubt.

6. **You must relinquish sufficient authority** in order that the subordinate can do the job properly. Sometimes the responsibility you assign requires a certain amount of authority over others in the organization. This is not a minor thing! For example, a clerk may be delegated to collect figures for reports you want to make. Unless it is known that he is acting under your authority, he may find it difficult to get figures from people who are higher up in the organization than the clerk himself. On the other hand, it is quite conceivable that you might delegate to a subordinate department head the authority to hire, fire and arrange the pay scale of the people he is working with. A surefire way of telling whether or not you are delegating authority properly is to measure the number of times that workers go over the head of their subordinate to come to you as the boss to get something settled.

7. **You must retain control of the operation.** When you delegate you never really get rid of the responsibility. You can retain control by requiring reports of various types and by personal inspection of what's going on. Control insures coordination to make sure the assigned job ties in with other objectives and puts the over-all operation in its proper perspective.

8. **Be sure to follow up.** Don't wait until the job you have delegated is complete because errors could be too expensive and too hard to correct. This is especially true when the responsibility that you have delegated is large, or new, or difficult to handle.

As will be seen from the above, delegation is not an easy task. The manager must take risks, particularly in selecting the subordinates who are to run certain phases of the operation. It is necessary to face the fact that the man you delegate may not measure up the way you think he should. And don't be surprised if the assignment ends up in some unexpected fashion even though it was completed successfully. If you find that delegation is not working for you, self-appraisal is in order. Check your procedure for delegating, re-examine your training program and improve your own coaching standards. Next month in these columns there will be a discussion of "When to Delegate." That, too, is another decision that the executive must make frequently.

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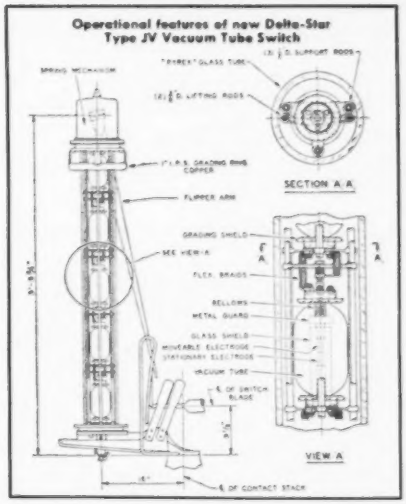

—the DELTA-STAR MKV-40 Vacuum Tube Switch

RATINGS UP TO 138kv. The new Delta-Star MKV-40 Vacuum Tube Interrupter Switch answers the need for a high-voltage, high-current interrupting device of long service life at reasonable cost.

Especially well suited for switching capacitive loads, the MKV-40 operates on a thoroughly proved principle whereby the series of high-dielectric-strength Jennings vacuum tubes is in the circuit only during the interrupting cycle. Tubes are also relieved of the duty of re-making the circuit. Long, reliable service life is thereby designed into this high-current interrupter.

Positive interruption occurs at first current zero, and restrikes are eliminated by the high dielectric strength of the vacuum switch. The vacuum tube switch is maintenance-free throughout. Currents as high as 600A (load) and 200A (capacitive) may be handled with an expected service life of 5,000 operations.

For prints and technical literature, call your nearest Delta-Star representative, or write today direct to *Delta-Star Electric Division, H. K. Porter Company, Inc., 2437 Fulton Street, Chicago 12, Illinois. District offices in principal cities.*

H. K. PORTER COMPANY, INC.

DELTA-STAR ELECTRIC DIVISION

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The Year Advertising Helped

This editorial message was first published by McGraw-Hill two years ago. It describes advertising's dramatic contribution to the American economy during 1954. The theme of the editorial—that advertising can help promote economic stability by stimulating sales at a crucial time—is even more pertinent today.

As our economy grows, it is constantly changing. The conditions business faces today are not the same in every respect as those it faced in 1954. But business again has the opportunity, through advertising and other selling efforts, to help sustain a high level of economic activity. At the same time, it will be building markets for the period of renewed expansion that is sure to follow.

This editorial is reprinted exactly as it appeared in 1956 except for minor editorial changes to bring it up to date. Permission is freely extended to newspapers, groups or individuals to quote or reprint all or parts of the text.

Donald C. McGraw

PRESIDENT

McGraw-Hill Publishing Company, Inc.

IN 1954 we had a business recession in the United States. Sales fell about 4% during the year. If management had followed the historic pattern of business ups and downs, advertising volume would have fallen much further.

But in 1954 the volume of advertising did not fall. It increased over 5%, and expenditures in all major advertising media rose. Every effort was made to stimulate sales when sales were needed to sustain prosperity.

This was something entirely new under the sun. It had a powerful influence in making the recession of 1953-54 one of the mildest on record. It helped greatly to speed business on to the record-breaking levels it attained in the years 1955-57.

There are several reasons why America's business management attacked this decline in sales with more advertising. One of them grew out of the greatly strengthened position of the American consuming market. Consumers' income after taxes has been rising an average of over $10 billion a year since 1946, and this rising income is more widely distributed than ever before. Furthermore, consumers had piled up reserves of about $200 billion in cash or its equivalent. These reserves offered a new and powerful inducement to increased selling and advertising effort even in the face of a possible decline in consumer income. (At the end of 1957, consumer reserves were $225 billion.)

Taking the Longer View

However, the principal reason why a sales decline was attacked with increased advertising is management's new-found conviction that good advertising is essentially an investment in the development of a market. Successful development requires sustained investment. The inclination of business management to take this longer view is, of course, motivated

McGraw-Hill PUBLISHING COMPANY,

ABP HEADQUARTERS FOR

Kill a Business Recession

by the fact that the American market, with over 3 million consumers being added annually, is growing at a prodigious rate.

Ten years ago only a handful of companies had plans for investment in new producing facilities extending beyond the current year. Today almost all leading companies have investment programs running some years ahead. And keeping pace with these long-range investment plans has been the development of sales and advertising programs to reach tomorrow's greatly expanded markets.

Advertising's Key Role

This crucial role of advertising in providing driving power for our economy is gaining greater recognition every day. In his book, "People of Plenty," Professor David M. Potter of Yale University remarked: "Advertising is not badly needed in an economy of scarcity, because total demand is usually equal to or in excess of total supply, and every producer can normally sell as much as he produces. It is when potential supply outstrips demand—that is, when abundance prevails—that advertising begins to fulfill a really essential economic function."

Today abundance so completely prevails in the United States that it has been conservatively estimated that as much as a third of everything offered for sale falls in the realm of "optional consumption." That is, consumers can "take it or leave it" without any immediate personal inconvenience. But if they decide to "leave it," a terrific economic depression will not be far behind. In such circumstances, advertising—in which, in all of its forms, we are now investing over $10 billion annually—clearly is of crucial importance to our continued prosperity.

In performing its key role in past years, American advertising never realized its full potential. It successfully promoted sales. But it never was called upon to promote an overall economic stability as a direct outgrowth of increased sales.

By successfully promoting both sales and economic stability, as it did in 1954, advertising surely has added new strength to the American economy. It has also added a great new and constructive dimension to advertising itself.

One of the surest means of expanding your sales volume in today's industrial markets is through dominant advertising in the publications directly serving your major customers and prospects.

McGraw-Hill's business and technical publications can give you quick access to the men who initiate, specify and approve the purchases of industrial products and services. Because all are leaders in their respective fields, you are assured a maximum return on your advertising investment when you *concentrate* in the McGraw-Hill publications serving your most important markets.

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BUSINESS INFORMATION

SMOOTH BORE!

Orangeburg Fibre Conduit Prolongs Cable Life

Protect cable sheath from abrasion and you prolong the life of underground cables, say utility engineers. Scoring of cable sheath creates "trouble spots" that shorten cable life.

That's where Orangeburg Fibre Conduit plays an important part in keeping cables healthy. Orangeburg's smooth bore, its low coefficient of friction minimize the danger of abrasion when cables are pulled in, as well as later on during cable movement. By protecting cable sheath from abrasion, Orangeburg Fibre Conduit adds years to cable life.

Orangeburg's impermeable wall and watertight joints protect cables from corrosive ground waters. Its nonmetallic material is strong, tough, resilient, long lasting.

And, remember, Orangeburg lays faster and at lower cost than other types of conduit. It is light in weight, easy to handle, easy to tool on the job. Spacers, bends, fittings, 5° bend sections and lightweight tapering tool, all combine to simplify installation.

Since 1893, records of long life have proved Orangeburg's durability and economy.

Orangeburg Fibre Conduit is distributed by Graybar Electric Company and General Electric Supply Company with branches and stocks in principal cities.

Another fine product!

Underfloor Duct by ORANGEBURG®

For Distribution of Electrical Wiring in Commercial, Industrial and Institutional Buildings

Since 1921 Non-Metallic Underfloor Duct by Orangeburg has been selected for many of the country's outstanding buildings because of its safety, flexibility and low installed-cost. To learn how an Orangeburg Underfloor Duct System keeps a building *electrically* modern for its lifetime, write for Catalog 201.

WRITE DEPT. WE-48 FOR NEW CATALOG 52.

ORANGEBURG MANUFACTURING CO., INC., Orangeburg, N. Y. West Coast Plant, Newark, Calif.

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INSULDUR

a major breakthrough in insulation for all Westinghouse pole-type distribution transformers

Only the Insuldur system gives your distribution transformers the ability to live longer. This patented process makes practical further increases in distribution loads without endangering normal service life or permits longer life with present loading.

YOU CAN BE SURE... IF IT'S

Westinghouse

here is what the

INSULDUR®

system is:

A product of Westinghouse research that will protect major . . . layer . . . and turn-to-turn insulation in pole-type distribution transformers. The basic components that make this possible are:

- Inhibited oil
- New high-temperature enameled wire
- Insuldur insulation

These three basic factors comprise the Insuldur system—available only in Westinghouse distribution transformers.

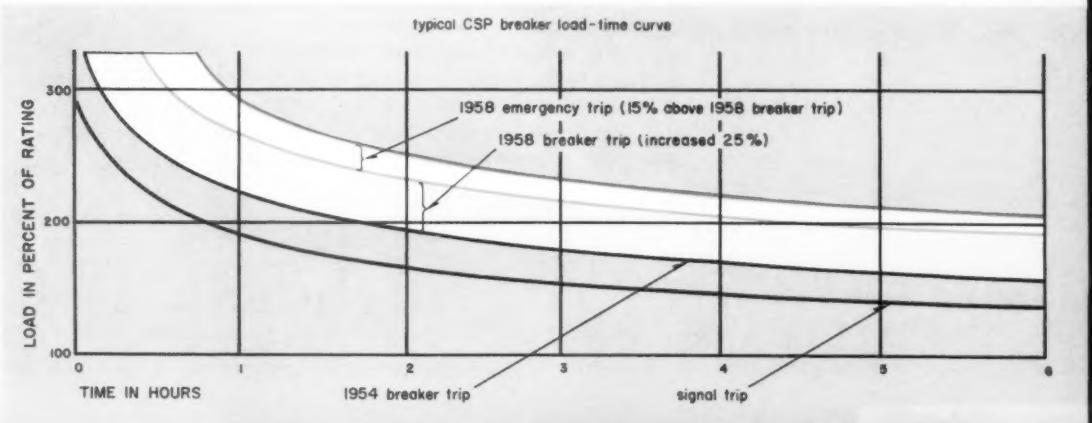
here is what the

INSULDUR

system does:

It allows the operating temperature to be raised 25% above the 1954 Westinghouse distribution transformer—without sacrifice of normal service life. This means that you can . . .

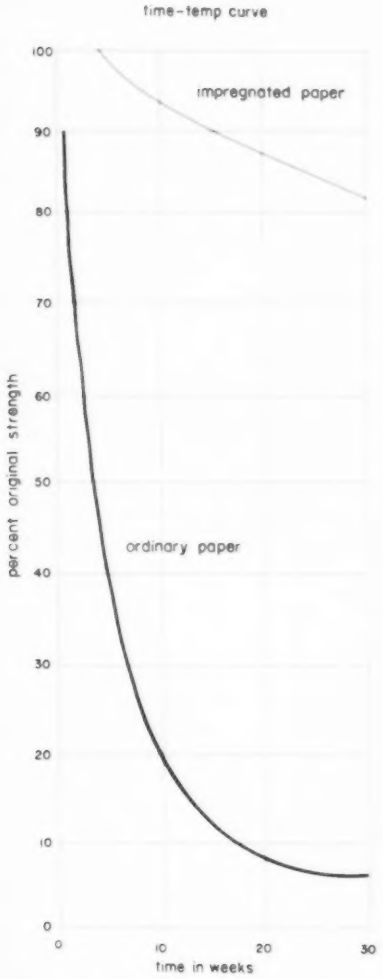
- load transformers heavier with the same life expectancy
- or increase life expectancy while maintaining present loading practice



and here is <u>proof</u>:

INSULDUR "stays alive"

when other insulations char, crumble and "die"



Aging-rate curves of ordinary paper and the Insuldur paper. The extra resistance to aging shown in these results proves the Insuldur system 10 times stronger.

Visual inspection shows that insulation from an ordinary transformer has darkened and tended to carbonize from the effects of service aging. The insulation from an Insuldur-protected transformer shows little change due to the combination of heat, moisture, oil and mechanical stress.

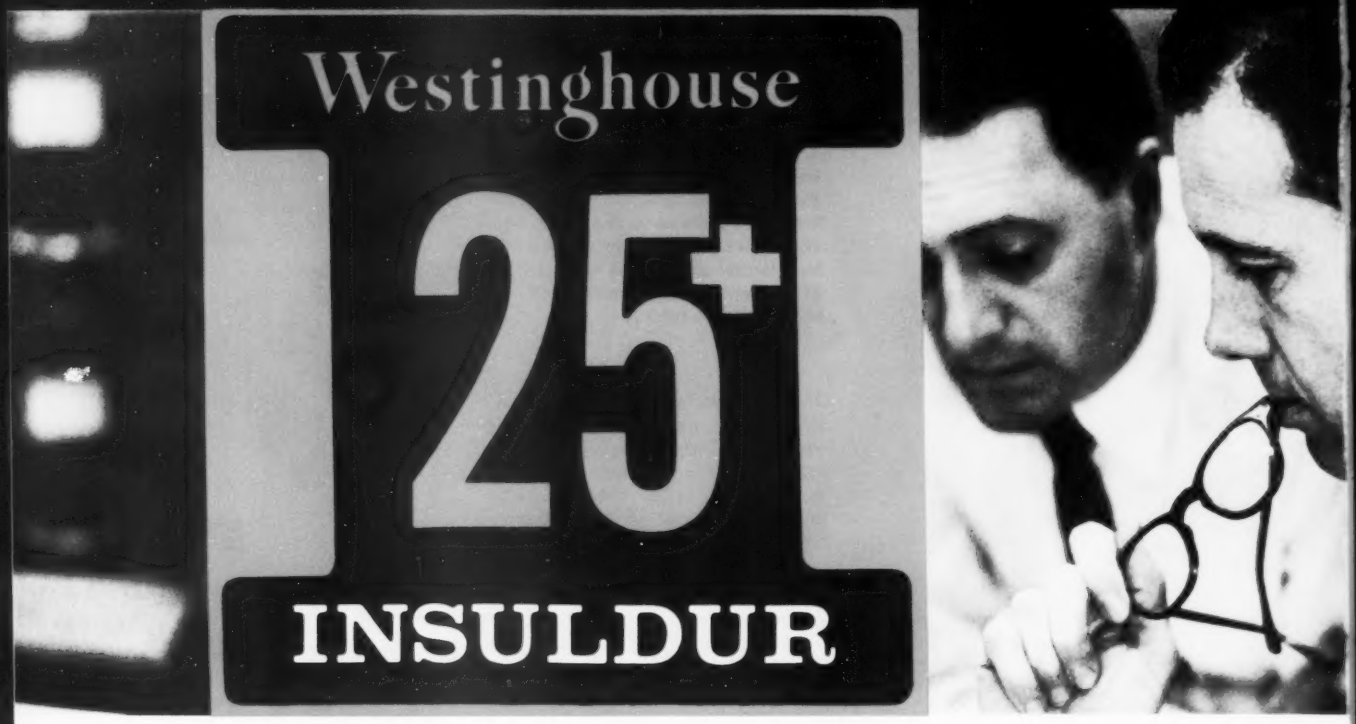
The "Crumble Test" offers proof that transformers not protected by the Insuldur system are in danger of having their service life shortened. Here is proof, too, of the extra life built into every Insuldur-protected transformer.

Here the ordinary insulation has "died," while Insuldur insulation has sprung back, full of life. This means that under conditions such as short circuits in actual transformer service, ordinary insulation—and the transformer itself—could "die" . . . but the Insuldur-protected transformer would continue to live.

TRY IT! Perform the "Crumble Test" yourself . . . compare the resistance to service aging exhibited by Insuldur insulation with the breakdown of ordinary insulation. Call your Westinghouse representative . . . he will be glad to supply you with samples of both, so that you can prove for yourself the amazing durability of Insuldur insulation.

INSULDUR*

protected transformers are identified by the big "I"



*another improvement in distribution transformers created by PLOWBACK of earnings into research

Again, in the creation of Insuldur, Westinghouse leadership in distribution transformer development is maintained by plowing back earnings into research—pure and applied . . . into design and development engineering . . . into test facilities. That's why Westinghouse distribution transformers bring you tomorrow's performance—today!

J-70843-R-4

YOU CAN BE SURE...IF IT'S Westinghouse

Quality makes the big difference in close quarter installations

install Republic ELECTRUNITE E.M.T. because

THE BEST COSTS LESS INSTALLED

Addition to St. Luke's Hospital, Milwaukee, Wisconsin, is a typical example of a Republic ELECTRUNITE close quarter installation. Architect: Grassould & Johnson; General Contractor: Siesel Construction Company; Electrical Contractor: Bently Electric Company.

Install Republic ELECTRUNITE® E.M.T. Deliver a top quality job at the best bid because... the *best* costs *less* installed. Built-in quality makes the big difference.

Republic ELECTRUNITE E.M.T. is produced from highest quality flat-rolled open-hearth steel made in Republic's own mills and carefully inspected to Republic's rigid manufacturing requirements. Quality is built-in.

Republic ELECTRUNITE "INCH-MARKED" in feet and inches up to 1¼" sizes is an exclusive easy-to-use feature that offers installation economies. Full length "GUIDE-LINE" keeps bends in line, saves wasted time and material. And "INSIDE-KNURLING", another exclusive ELECTRUNITE feature, makes wire pulling as much as 30% easier. Additional examples of Republic's built-in quality.

Lightweight, easy-to-handle ELECTRUNITE is the most practical and economical raceway in close quarter installations, too. To make tight joints, simply tighten the fitting, not the entire run—a real aid where working space is limited.

And because quality is built-in Republic ELECTRUNITE E.M.T. meets building code requirements...is produced to A.S.A. Specification C.80.3 and Federal Specification WW-T-806, (latest revisions) and carries the Underwriters' Laboratories Seal of Inspection.

Install quality—install Republic ELECTRUNITE E.M.T. For additional information call your Republic ELECTRUNITE distributor or send coupon today.

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I would like to learn more about Republic ELECTRUNITE "INCH-MARKED" and "GUIDE-LINED" E.M.T. features.

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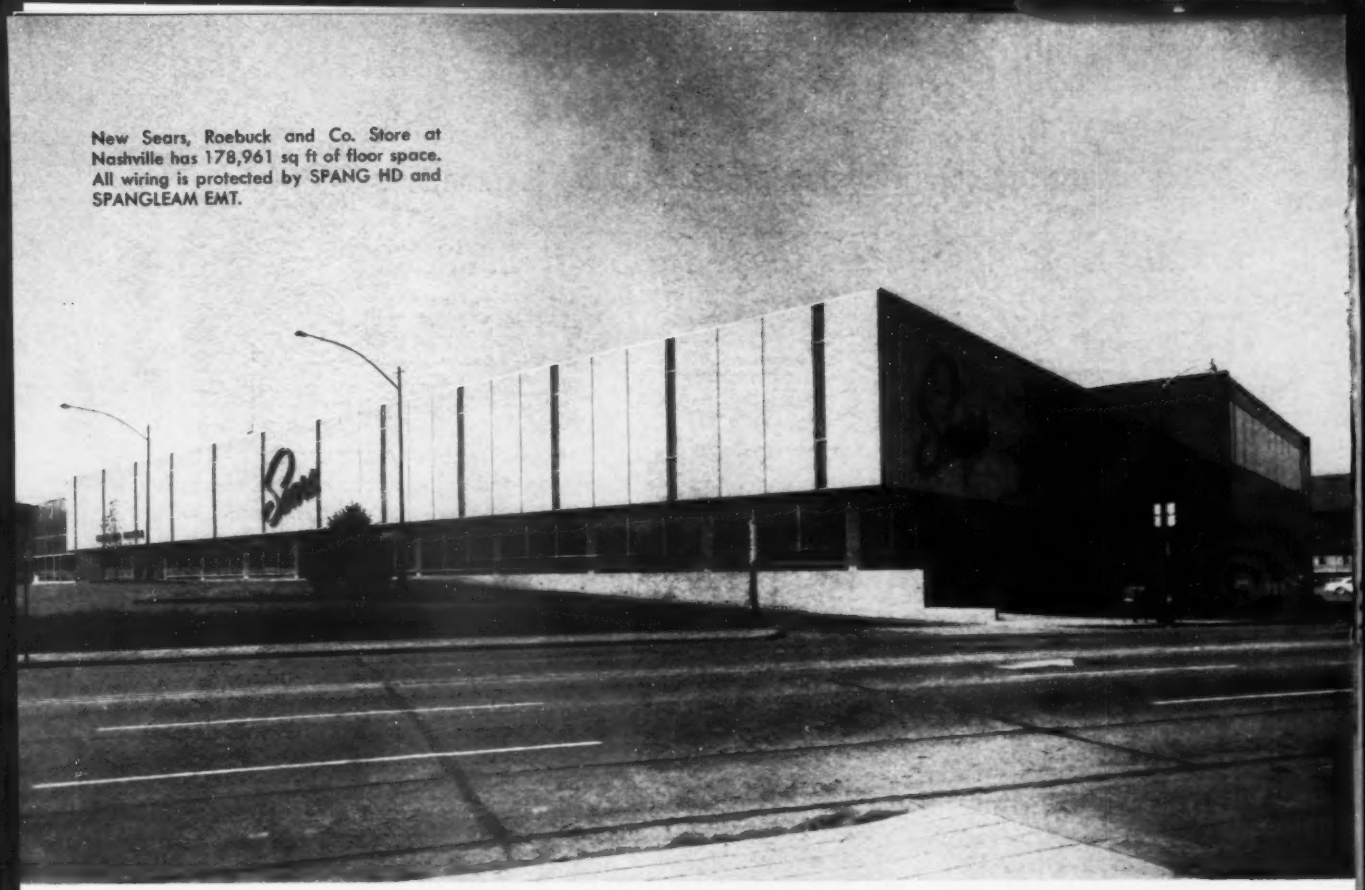
Address _____

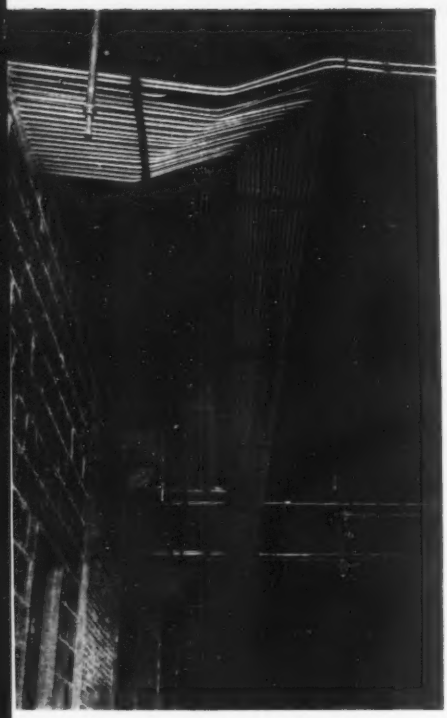
City_____ Zone____ State_____



New Sears, Roebuck and Co. Store at Nashville has 178,961 sq ft of floor space. All wiring is protected by SPANG HD and SPANGLEAM EMT.

"SPANG® Conduit's easy handling saved us installation time"

says Mr. Leon Harlan, Ramsey Electric Co., Nashville, Tennessee



59,000 ft of SPANGLEAM EMT, 77,170 ft of SPANG HD went into this store. Easy handling of conduit saved time, kept costs down.

"We installed 77,170 ft of SPANG HD Galvanized Conduit and 59,000 ft of SPANGLEAM EMT to protect the wiring in the new Sears, Roebuck & Co. store at Nashville, Tennessee," reports Mr. Harlan. "Because it was so easy to work with, we saved considerable time on installation which also helped keep costs down.

"SPANG HD was easy to cut and thread. Bending was fast and accurate. The conduit was clean and free of burrs and obstructions which otherwise might have caused trouble on wire pulling.

"We used SPANGLEAM EMT for short runs, and we had good results with it, too. The EMT was delivered bundled with blue plastic tape instead of rope. This was an important safety factor, because the tape makes a strong bundle and lengths don't slip out of place."

You get top quality with SPANG

. . . because SPANG Conduit is made under *quality-control* conditions, and is tested and inspected before shipping to be sure you get a quality product every time.

If you've never tried SPANG, now's the time to start. Order it for your next job. You'll get quality service from your local SPANG Distributor, too.

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SPANG CONDUIT

SPANG-CHALFANT
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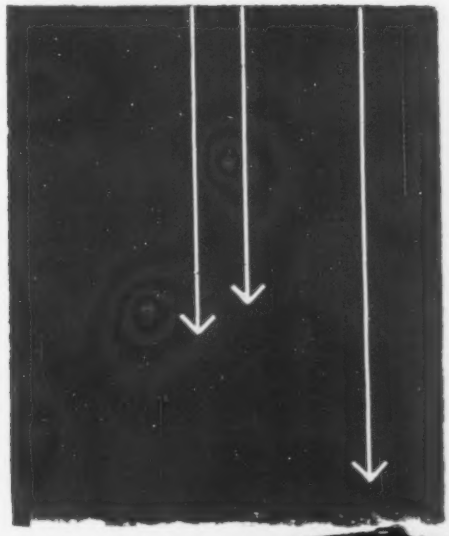
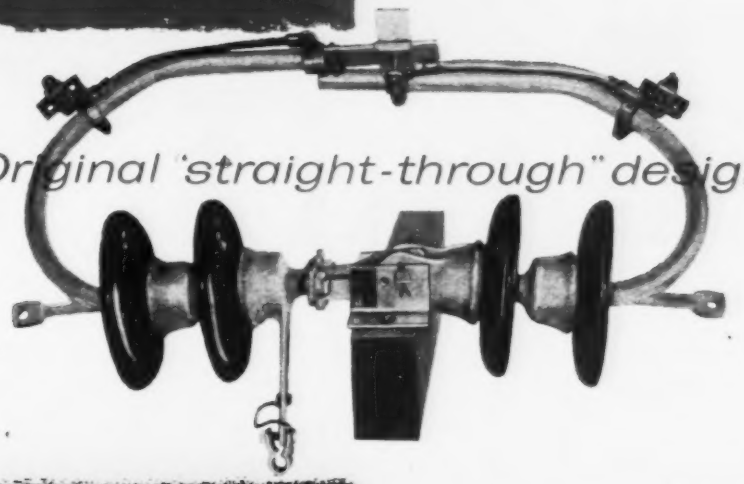
TWO GATEWAY CENTER, PITTSBURGH, PA.
District Offices and Sales Representatives in Principal Cities

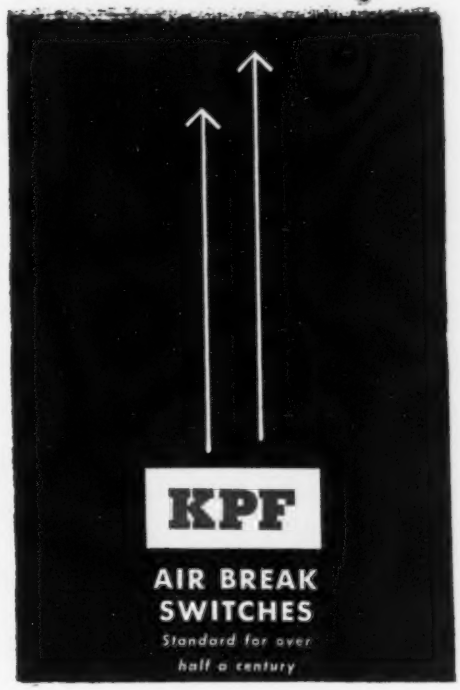


Only KPF switches look like this

simple, attractive, trouble-free, proved in 50 years service



Original "straight-through" design



You always know when a power company is using KPF switches. (As more and more are today). You can't miss the clean, functional "straight-through" appearance of KPF phase units. This same design simplicity that produces pleasing pole top appearance also insures all-weather operating ease. KPF switches have no temperamental mechanisms to malfunction, freeze, lock, need lubrication or wear out.

KPF switches have proved their dependability in over 50 years service on major utilities. Make a test installation of the original, "straight-through" air break switch on your system this month.

Write direct for catalog.

KPF ELECTRIC COMPANY

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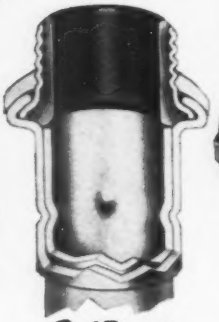
B-M

the original concrete-tight **INDENTER FITTINGS** *for E.M.T.*

Red Throat
Insulated Connector



Red Throat
Cross section

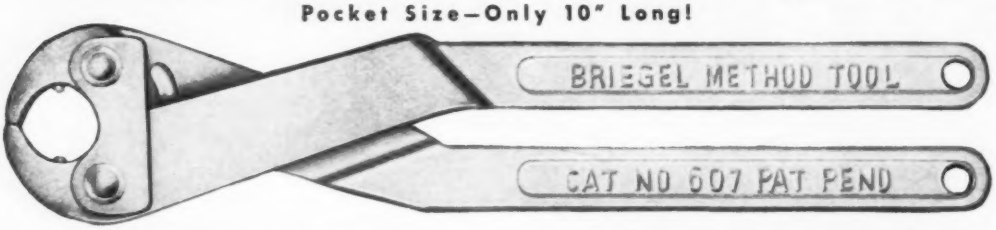
"BM" #100
Cutter for ½, ¾ and 1" E.M.T.

"BM" #1000
Holder for ½, ¾ and 1" E.M.T.

"BM" #600
Changeable Jaw Indenter

THE NEW BM607 INDENTER FOR ½" FITTINGS

Pocket Size—Only 10" Long!



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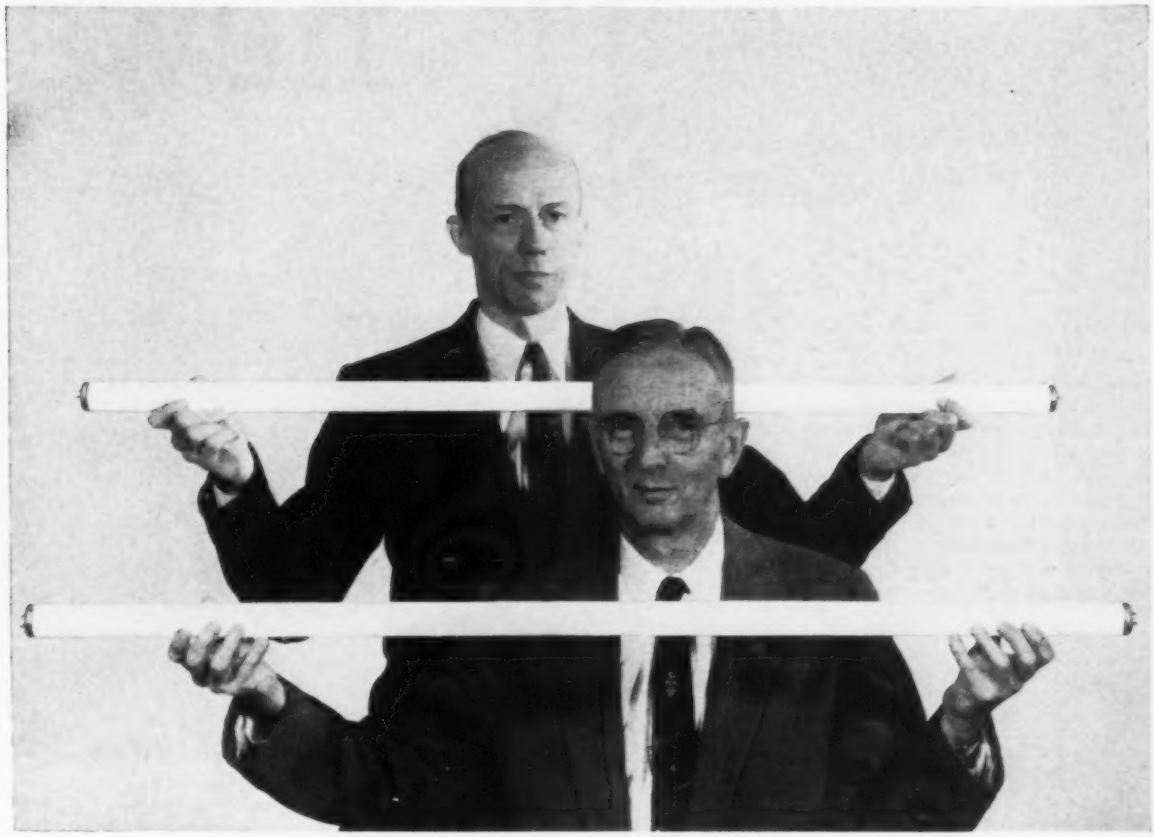
SOLD ONLY THROUGH ELECTRICAL WHOLESALERS

GENERAL ELECTRIC'S 20th FLUORESCENT ANNIVERSARY ANNOUNCEMENT:



R. N. THAYER (left) AND G. E. INMAN developed first commercial fluorescent lamp in the U.S.A. in 1938. Still with General Electric, they have been key men in many G-E fluorescent lamp improvements.

Today's G-E Fluorescent Lamps give your customers 76% more light per watt, last 5 times longer...yet cost ½ as much!

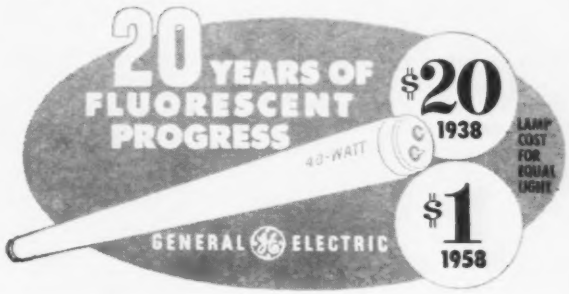
The first fluorescent, introduced 20 years ago this month by General Electric, can't hold a candle to today's G-E 40-watt Lamps. A steady stream of improvements from G.E. in Rapid Start and Pre-Heat Lamps has provided up-to-the-minute lighting systems for G-E Lamp users. Efficiency is up 76%, rated life is 5 times longer, and the list price is down 57%. *This means one G-E Fluorescent Lamp dollar today buys as much light as $20 did 20 years ago!*

NEWEST IMPROVEMENT—"BONUS PHOSPHOR" This revolutionary new G-E process gives your customers 7 to 9% more light by selecting only the bigger, brighter phosphors to be used in G-E Lamps. It is another dollar-and-cents reason why they get more for all their lighting costs with General Electric Lamps.

This "Bonus Phosphor" is now available in the 40-watt and new Power-Groove—and will soon be used in all G-E fluorescent lamp types. For the whole "Bonus Phosphor" story—see or write your local General Electric Large Lamp Salesman.

Progress Is Our Most Important Product

GENERAL ELECTRIC



news

This is the new home of California Electric Power Co. in the San Bernardino-Rialto area. Employees reported for work in the new headquarters on March 17. The general service center of the company is directly across the street. Design of the office building was by Austin, Field & Fry, architects, after Calectric studies by a planning committee headed up by John Mangel, the company's architect. It is on a 40-acre site. *(See Management)*

Failure of a 5-ft storm drain during heavy rainfall in the Los Angeles area flooded the site of Scattergood steam plant, now under construction by Los Angeles Department of Water & Power. *(See Growth)*

Dean James G. McGivern (right), Gonzaga University, describes theory of heat loss and gain to three other program speakers at the Washington Water Power-Gonzaga electric heat and heat pump forum in Spokane. L. M. Roberson, Norman Adcock and Thomas M. Hart are with McGivern. *(See Market Development)*

The Westinghouse manufacturing and repair plant opened last month in Compton, Calif., is one of six the company operates in the West. Shown here is the main repair aisle, which stretches 400 ft from end to end. The plant has 80,000 sq ft of floor space under 38-ft-high bays with 100 tons of crane capacity. It can handle transformers in ratings up to 25,000 kva and 230 kv, larger units than any other commercial repair operation in the West can take, according to Frank H. Robb, plant manager. Motor repair methods have been improved, he said. *(See Manufacturers)*

Management

Gas Line Bigger

Provided the supply justifies it, Pacific Gas and Electric Co. and its associates plan to step up exports of natural gas from Alberta to the California area by nearly 100% through increasing the capacity of the line from 450,000,000 cu ft to more than 800,000,000 cu ft per day. While the initial design will have a capacity of 420,000,000 cu ft, it is designed to permit enlargement of its capacity to the larger figure.

The pipeline system will span approximately 1,300 miles, originating about 130 miles northwest of Edmonton, Canada, and will cross the international boundary near Kingsgate, B. C. Then it will run southwest through Idaho, Washington, Oregon to its terminal at Antioch, Calif. Three companies will be involved in the transmission system. One will be a Canadian company which will own and operate the section of line extending from Coleman, Alta., to the international boundary. The Pacific Gas Transmission Co., incorporated under the laws of California, will construct, own and operate the section of pipeline extending from the international boundary to the Oregon-California border. There Pacific Gas and Electric Co. will purchase gas from PGT and will construct, own and operate the section of pipeline extending to the Antioch terminal. In addition the main transmission line will be tapped to provide delivery of 30,000,000 cu ft per day to the Montana Power Co. through its subsidiary, the Canadian-Montana Pipeline Co.

Pacific Gas and Electric Co. serves more than a million and a half customers in northern and central California with gas which, during the current winter, had a peak of 1.76 billion cu ft per day. Approximately two-thirds of this total comes from the El Paso Natural Gas Co. at present.

► The Army Corps of Engineers has opened an area office in Cheyenne, Wyo., to supervise construction of the new $100,000,000 missile base program in that area. Almer C. Engle has been named acting area engineer.

► L. N. McClellan, one of the nation's outstanding engineers, retired from the post of assistant commissioner and chief engineer of the Bureau of Reclamation on Feb. 28. This closes a distinguished career of more than 46 years in the development of water and land resources that has included the development of many outstanding engineering accomplishments. Plants such as Grand Coulee, Shasta and Hoover were designed under his direction. McClellan plans to continue in engineering as a private consultant, one of his first clients being the USBR.

McClellan

New Wheeling Contract

The Bonneville Power Administration will wheel 65,000 kw of firm power from the California Oregon Power's southern Oregon generating plant to the Reynolds Troutdale, Ore., aluminum reduction plant under the terms of a new contract extending to 1973. Copco power will be used to firm up BPA's interruptible power contract with Reynolds. After July 1, 1959, the firm power commitment will be increased to 95,000 kw.

The new contract will enable Copco to collect on an exchange account under which it had been wheeling 65,000 kw of firm power for BPA to the Hanna Nickel Smelting Co. near Riddle, Ore., for a number of years. At the end of 1957 BPA owed Copco 670,000,000 kwh which has been uncollectible because Copco's northern system, where BPA could physically make the payments, could not support such power imports.

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Settlements on Stalled Project

The city of Tacoma has reached agreements to settle three contracts involved in the stalled construction of its Cowlitz River hydroelectric development.

Controversy between the state and the municipality over condemnation of state-owned property which would be flooded by the reservoir behind Mayfield Dam has reached the Supreme Court level but a decision cannot be expected for some time.

Under the agreements Allis-Chalmers Mfg. Co. will be awarded $15,000 on its $2,547,000 contract to build four generators while the United Power Co., holder of a contract for 13 transformers, will get $62,685. The general and one subcontractor will get $150,000 but the city will gain possession of the aggremany years, manager since 1953.

► Thomas M. Keenan has been appointed an assistant general manager of Pacific Power & Light Co. to head a new division comprising the company's service districts in eastern and central Oregon. His former position as district manager at Pendleton will be taken by **Eldon Brennan**, who has been local manager at Prineville. **Robert H. Love**, lineman-agent at Condon and Fossil, Ore., goes to Prineville. Keenan has been with the company since 1922, and was Pendleton district line superintendent for many years. He has been manager at Pendleton since August 1953.

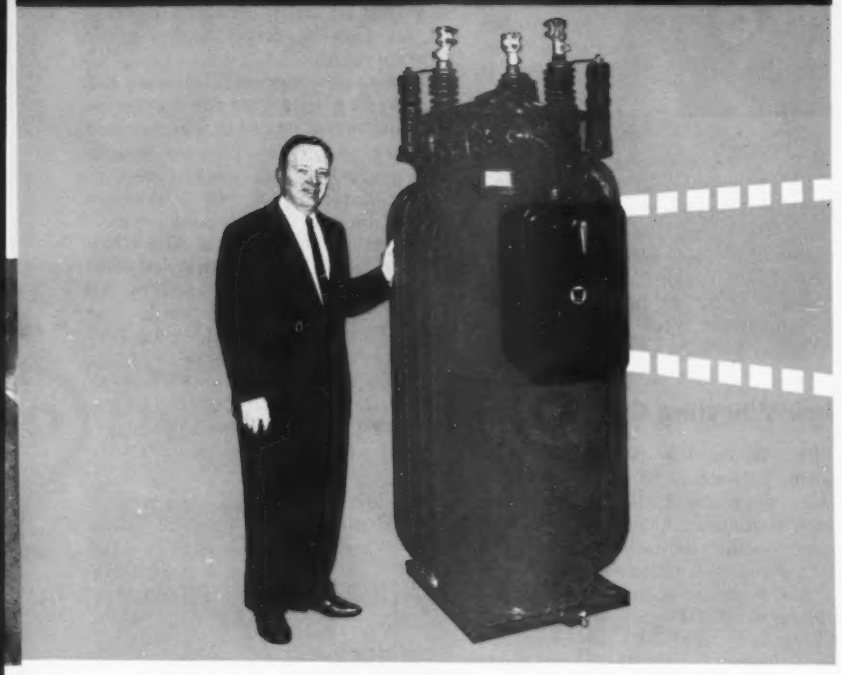
Keenan

Kwh from "Waste" Water

Portland General Electric will buy "waste water" from the city of Portland's Bull Run water system for a rate of .83 mills per kwh. The water from the city's domestic water sup-

Ask your
Westinghouse representative
about the exclusive benefits
you get from

URL AND URF REGULATORS...
WITH THE RELAY
THAT "READS" THE VOLTAGE



Inverse-time delay characteristics permit the CVR relay to match the correction to the need, correcting for large voltage errors quickly, for small errors with moderate speed. Because it "reads" the voltage, interpreting the rate of change, corrections are made faster than with fixed-time delay relays.

URL and URF regulators meet *all three* basic voltage conditions more effectively because:

- Gradual voltage changes . . .
  relay operation immediately outside band limit.
- Large rapid voltage changes . . .
  lower relay operating time . . .
  faster correction.
- Irregular, self-correcting voltage changes . . .
  no relay operation.

Result: better voltage control, narrower effective bandwidth.

Call your Westinghouse representative for the full story of improved customer service through URL and URF regulators equipped with the inverse-time delay relay . . . made possible by PLOWBACK OF EARNINGS into research and development for better means of voltage regulation.

J-70869

YOU CAN BE SURE...IF IT'S Westinghouse

ply will be used to add to the peaking capabilities of PGE's Station O located at Roslyn Lake not far from the Bull Run headworks. The diversion of the excess water will add about 44,000,000 kwh to the power station's 93,000,000-kwh production in the median year and city engineers estimate that the city will collect about $36,000 in normal years.

► B. E. Lowe has been promoted to vice-president and assistant to the president of the Sierra Pacific Power Co. He has been associated with the company since Oct. 1, 1957, but prior to that time has had a wide experience in the utility field in Oklahoma, Missouri and Canada.

Lowe

New EEI Employee Course

A new employee education course named "The American Economic System" is designed to be given as a six-month program by company conference leaders in one-hour-a-month classes for employee groups. The course, which is being offered to its member companies by the Edison Electric Institute, is built around a 96-page book which is used as a text together with a leader's manual and a course kit comprised of color film strips, demonstration materials and other visual aids to create a high degree of interest. Object of the course is to inform employees more fully about the American economic system and to correct ideas about economics, which surveys indicate are widely misunderstood.

► E. F. Johnson has been elected a vice-president by the Southern Nevada Power Co. He previously had been general superintendent (since July 1957) and will continue to supervise the operation and maintenance of power plants and construction, and the operation and maintenance of distribution and transmission lines and substations. Before joining Southern Nevada Power's executive staff in 1956, he was employed by American Foreign Power Co. in Rio de Janeiro, Brazil.

Johnson

Growth

Water Outlook

In a March 1 report, California Department of Water Resources stated that the 1958 season continues as an excellent water year, with above normal runoff in most areas. This favorable condition should continue if normal precipitation is received for the rest of the season.

Heavy precipitation in February caused record quantities of runoff during the month in many streams, but the snow-melt runoff is forecast as near normal.

In the Puget Sound-Cascade region, consulting engineer Jack D. Stevens recently reported that snow surveys indicate there will be adequate runoff during the spring and summer months to fill reservoirs and maintain power output.

Problems on Pend Oreille

Speaking before a group of mining interests at Spokane, Seattle's Mayor Gordon S. Clinton made the following statement with regard to the proposed Boundary Power project: "I wish to make it clear that the city of Seattle would not wish to proceed with construction of the dam and operation of the reservoir if there were a serious question of damage to existing or potential future mines.

"Cost for modification of mining facilities, additional inconvenience or increased mining costs, if caused by the construction and operation of the reservoir, would be borne by the city. It is therefore in the city's interest to take all the precautionary measures recommended by consultants. This we are committed to do."

At a second meeting, the Northwest Mining Assn. heard Pend Oreille County PUD Manager V. P. Campbell state that the PUD would not give up its Z Canyon Dam site on the Pend Oreille River unless it could secure a fifty-fifty partnership with Seattle City Light in the Boundary Dam project down stream from Z Canyon.

Campbell said that Seattle City Light had offered to sell the PUD 20% of Boundary Dam's power at cost, but he added that the PUD wants a full fifty-fifty partnership in the project not only in the right to buy the power but also in ownership.

The Boundary project would produce 540,000 kw, whereas Z Canyon would have a 240,000-kw capability.

► Following the recommendation of the Priest Rapids Dam advisory committee, Grant County PUD commissioners voted to proceed with plans for construction of Wanapum Dam. The next move on the part of the PUD will be to get commitments from potential power buyers for the more costly Wanapum power. A tentative schedule calls for start of construction in May 1959.

Bechtel to Study Wells

Douglas County PUD and Puget Sound Power & Light Co. have concluded an arrangement under which Puget will advance money to determine the engineering feasibility of a proposed dam at Wells on the Columbia River, in return for which Puget Power will have an option on at least one-third of the power output of the 402,000-kw project. Investigations at the site will start immediately under the direction of James Patrick, Bechtel project engineer.

Artist's sketch of Seattle City Light's proposed $150,000,000 Boundary project on the Pend Oreille River. License application for the project is now pending before FPC

CVR RELAY... AID TO BETTER REGULATION ...WITH

* less maintenance
* easier maintenance
* adjustable bandwidth

Because of built-in time delay, the CVR relay in Westinghouse URL and URF regulators operates its contacts only when a tap change is called for. Eliminating unnecessary operations reduces maintenance.

Maintenance is simplified by exclusive Flexitest* drawout construction which permits replacement of all relay control elements in only 10 seconds.

Lever-set voltage limits allow easy setting of the operating band, resulting in more accurate voltage levels. The time delay can also be adjusted easily and quickly.

* Trade-Mark J-70868

YOU CAN BE SURE...IF IT'S Westinghouse

CAT. NO. 1251-I
15 amps., 120-277 volts
Single Pole A.C. "Presswitch"
with thru-connection
and ivorine nylon button.

Truly velvet in performance . . . "Presswitch" responds to the gentlest press of the finger, touch of the hand or nudge of the elbow. It's the smoothest, most convenient and most efficient A.C. switch in Hubbell's famous family of switches.

"Presswitch" is designed for all general A.C. applications, particularly the control of large fluorescent lighting applications. It is as much at home in a factory as in a living room, for its attractive styling blends with any interior and its rugged precision-molded construction represents a new standard of durability and dependable operation.

"Presswitch" fits standard wall boxes, accommodates standard wall plates and operates in any position. It requires no special wiring.

Complete information is yours on request.

Cat. No.	Type	Button Style
1251	Single Pole with thru-connection	Brown Nylon
1251-I	Single Pole with thru-connection	Ivorine Nylon
1252	Double Pole	Brown Nylon
1252-I	Double Pole	Ivorine Nylon
1253	Three-way	Brown Nylon
1253-I	Three-way	Ivorine Nylon
1254	Four-way	Brown Nylon
1254-I	Four-way	Ivorine Nylon

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Political Fronts

PUD Fees Challenged

Karl Stoffel, a citizen of Cashmere, Wash., recently published an open letter in the *Wenatchee Daily World* addressed to the prosecuting attorney of Chelan County. In the letter the writer questioned the propriety and legality of paying nearly a quarter of a million dollars ($241,000) of public money for the services of one local lawyer by the Chelan County PUD.

The letter used such phrases as "apparent flagrant flouting of public responsibility" and "a colossal disregard for the propriety of handling public funds." The letter also made the statement that the payment of the fee was to be paid in special long-term bonds in order that the recipient could escape immediate income taxation on the entire amount.

Chelan County's prosecutor, Charles W. Cone, in a subsequent newspaper report, was noncommittal concerning the allegations.

Snake Project Revived

Alleging that the Federal Power Commission made basic errors in its decision to deny a license to Pacific Northwest Power Co. to develop Mountain Sheep and Pleasant Valley sites on the Snake River, the company has applied for a rehearing.

The company said the commission failed to recognize that the Nez Perce Dam, which was cited in the decision as an alternative to the company's two-dam development, would risk destruction of a vital fish resource. The Nez Perce Dam site is below the mouth of the Salmon River, recognized as one of the most important salmon spawning rivers tributary to the Columbia and Snake.

PNP said the FPC erred in failing to weigh the force of a strong, public opinion against the construction of Nez Perce and the hazards of proceeding in defiance of such an opposition. The company said further that, if completion of Nez Perce should be delayed as much as 10 years, its apparent superiority would disappear.

► The "bargaining" value of REA funds for generation and transmission in obtaining reasonable wholesale power rates was stressed at a Senate subcommittee hearing on appropriations by the National Rural Electric Cooperative Assn. NRECA also vigorously opposed action to raise REA interest rate of 2%.

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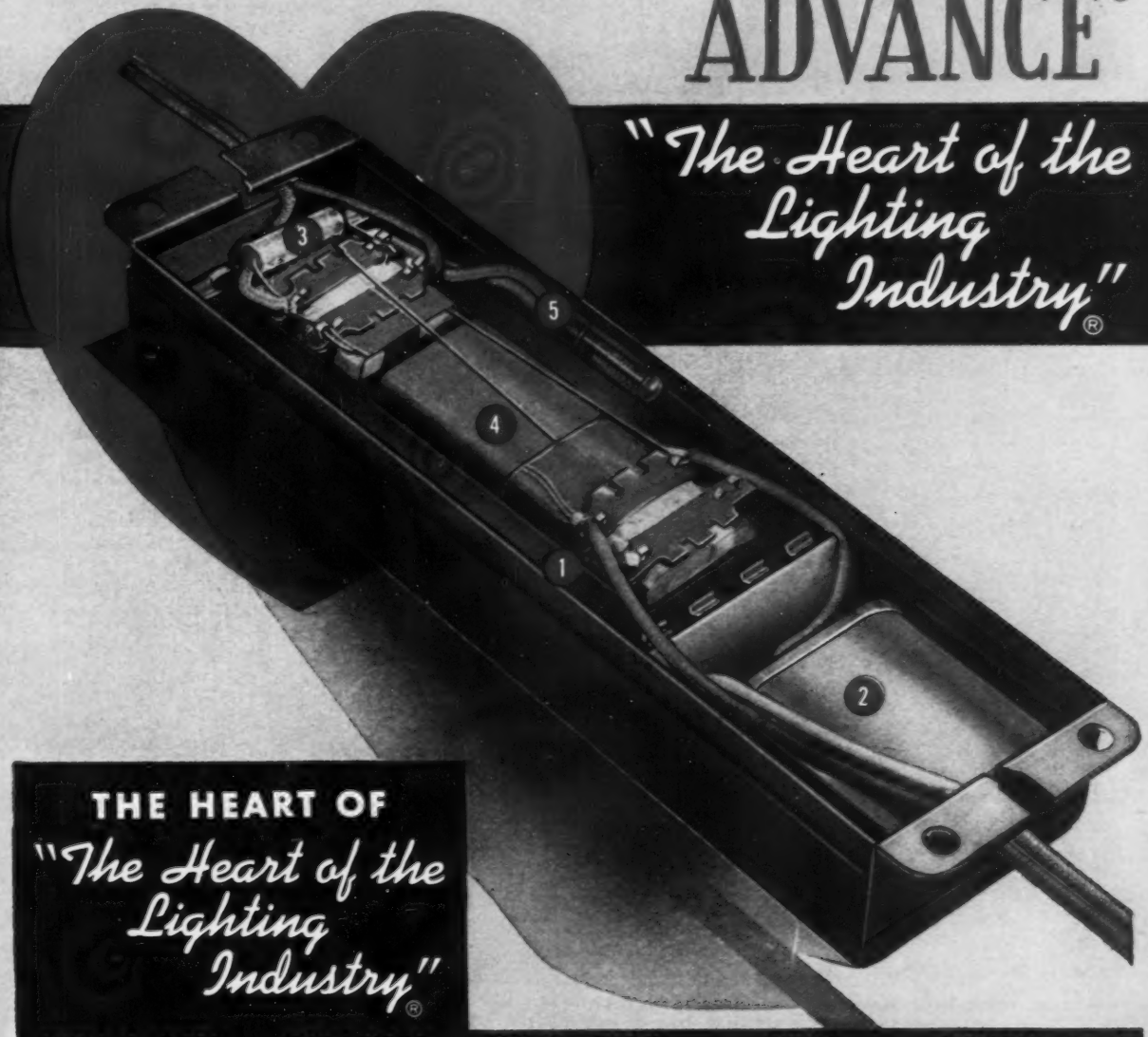
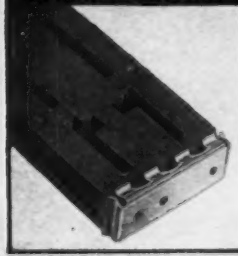
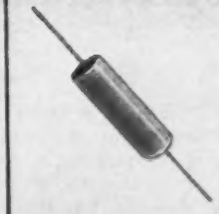
"The Heart of the Lighting Industry"®



THE HEART OF "The Heart of the Lighting Industry"®

SHELL & CORE	CAPACITOR	RADIO FILTER	COILS	ADVAN-guard
				

1 Constructed of high-grade silicon steel, punched to exacting tolerances and precision assembled. Core and shell are annealed to insure lowest wattage losses.

2 Capacitors for Power Factor correction and phase displacement are of highest quality construction. Rigid inspection and factory testing assure uninterrupted, dependable service.

3 Built-in filter corrects line feed back to the radio from the lamp through the power line and prevents direct radiation from the electric supply line to the aerial circuit.

4 Coils are firmly wound and are of identical size, shape, weight and operating characteristics. The complete assembly is vacuum impregnated with a thermal setting phenolic varnish.

5 A thermally actuated protective device that prevents ballast operation at abnormal temperatures thus increasing fluorescent lamp ballast life. Advanguard optional at additional cost.

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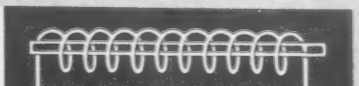
CBM CERTIFIED

World's Largest Exclusive Manufacturer of Fluorescent Lamp Ballasts



TRANSFORMER CO.

2950 NO. WESTERN AVE. CHICAGO 18, ILL. U.S.A.

Market Development

PP&L executives sport "I Like Ed" buttons at kickoff of company's nine-week dryer campaign. They are Frank Reis, general sales manager; Paul Crider, Wyoming sales manager; D. O. Bergey, assistant general manager for coast division; R. K. Foley, advertising manager. The buttons incidentally already have turned up as far away from home as Maine and so may be helping to sell dryers on the East coast too

Who Is Ed?

A nine-week hard-hitting "Buy Today" promotion of electric dryers has been touched off by Pacific Power & Light Co. The goal is to put 15% more dryers on the line than were added last year during the same months—March and April.

PP&L employees are being given an active part in the drive. Their prospects are being turned over to dealers to close and there is an attractive deal for employees who buy dryers—nothing down and no interest on time payments. Purchases, of course, are made through dealers.

Red and white "I Like Ed" buttons, worn by employees and dealers, are supposed to induce the question, "Who is Ed?"; open the way for the sales pitch.

► **An old foundry** done over like a castle houses the newest semidiscount house operation in Salt Lake City advertised as **"Long John Silver,"** complete with pirate accompaniment. Seems to be a franchised dealer, though, with the Hotpoint line. . . Another merchandising mutation in Salt Lake is labeled **FAIM.** A large barn is decked like an old-time bazaar, with various lines of merchandise handled by concessionaires. Circus-type advertising brings them to the big tent to shop while uptown dealers groan.

More About Electric Heat

New equipment in electric heating and insulation methods and materials were discussed at the electric heat and pump forum co-sponsored in Spokane by Washington Water Power Co. and Gonzaga University. More than 100 attended, including members of the electrical industry and their allies, educators and FHA representatives.

The forum was packed with information for people who agree with WWP Vice-president George Brunzell's opening statement that "electric heat is here to stay."

► The Western Housewares Assn. has expanded and has changed its name to the **Western Gift & Housewares' Assn.** Coordination is under direction of Don Wagener, Wagener & Swanson, at the San Francisco Mart. Bob McCarty, Cal-Dak Co., was recently elected association president.

War on Prices

Taking advantage of the current "price war" headlines, Graybar Electric Co. put on a novel promotion to sell the Norge line at Consumer City in Santa Ana.

On March 14-15 the store's employees dressed up in army combat regalia and wrote their orders in bunkers set up inside the store.

The National Guard, viewing the stunt as a method of promoting enlistments, agreed to set up an army tank near the store's entrance.

With this declaration of open war on prices, Graybar and Consumer City supported the "troops" with heavy newspaper and radio barrages and by a direct telecast over KTLA.

► **Frances Michaels,** director of the Hotpoint Home Economics Institute, was in the West last month for the 1958 series of **Use-Value meetings** that the company conducts for home economic teachers, utility people and others interested. The show has a reputation for being both informative and entertaining and this year's edition was no exception. At the Los Angeles show the home laundry script, Hotpoint Fashion Horoscope, was ably presented by **Clara Sherburne,** Western regional home economist for the company.

► **Appliance Merchandisers** Assn. office at Phoenix has been moved to Room 210, 1426 N. First St. The new office is larger and has adjoining parking for all committee meetings. Eileen Taylor has been employed as secretary to Manager Bill Johnson Jr. Miss Taylor was in the business development department at the Valley National Bank for 4½ years.

► **Price-Larson Appliances** has opened one of the area's largest new appliance stores in West Denver. Bob Price, president, said the store will sell General Electric, Admiral, Philco, Maytag and other brands.

► **S & L Department Stores** of Casper, Wyo., one of a group of 30 stores in the midwest and Wyoming, is entering the electrical appliance market for the first time. The store is stocking a full line of Hotpoint appliances, which were shown at the opening, March 13-15. The results

IF YOU WANT COMPLETE SAFETY IN YOUR SAFETY SWITCHES— REMEMBER THE "V" FOR VISIBLE BLADES!

The men who pull the switches will tell you what can happen when a switch, *believed* to be open—*isn't.* A lot of things can happen—and every one of them is bad. Personnel safety is in jeopardy. Motors can single-phase. Machinery and work can be damaged. Down-time can skyrocket.

Doesn't it make sense to insist on Visible Blade construction which gives you a road block against any of those possibilities? Doesn't it make equally good sense to insist on the safety switch which gives you that construction—plus a lot of other performance advantages?

HERE IS ANOTHER REASON WHY SQUARE D HAS HELD FIRST PLACE FOR MORE THAN 50 YEARS

Positive Pressure (SPRING LOADED) Fuse Clips

✓ Maintain positive contact as fuses alternately heat and cool. Fuses are held tight even where vibration is present or during short circuit surges.

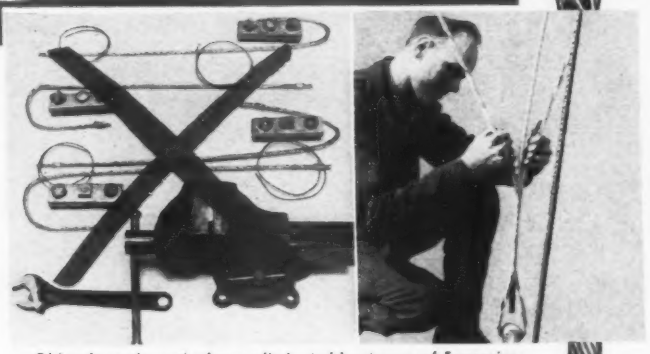
✓ Fuse clip jaws use pure copper for current-carrying parts and spring steel for pressure. They reduce heating 80% over commercial type clip.

✓ No clamps or screws to tighten—or to forget to tighten.

EC&M HEAVY INDUSTRY ELECTRICAL EQUIPMENT...NOW A PART OF THE SQUARE D LINE

SQUARE D COMPANY

UP TO 49% $AVINGS
on materials alone
with
Fine Fanner Superformed
FANNGRIPS
FOR DEAD-ENDING GUY STRANDS



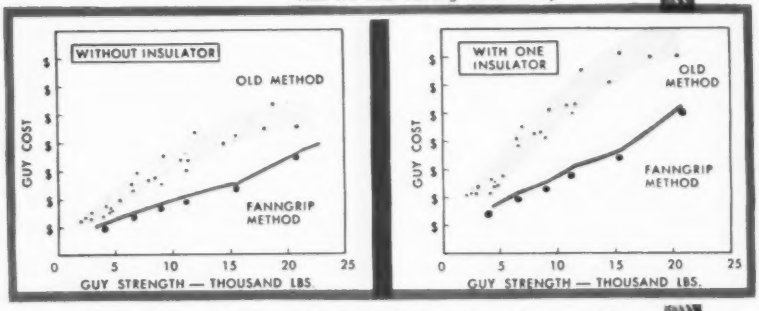
Old style costly methods are eliminated by the use of Fanngrips.

Now . . . costs compiled from typical guying methods using Fanner Fanngrips in comparison to other types of gripping devices show savings up to 49% *in materials alone* . . . in addition to the tremendous savings in time and labor!

Now . . . when savings are so important . . . here is more reason than ever to take advantage of the many Fanngrip features offered by no other type of gripping device:

- Provide maximum strand strengths.
- Eliminate laborious field fabrication.
- Self-clamping, permanently tight.
- Heavy coatings protect from corrosion.
- Do not damage guy strand surfaces.
- Dangerous and wasteful strand ends eliminated.
- Available in "B" or "C" coated galvanized steel, or copperweld.

Ask for cost-saving data today!



Two of a series of graphs demonstrating the savings available through Fanngrips over ordinary gripping methods.

Licensed for use under patent Nos. 2,275,019 and 2,587,521

Fine Fanner Superformed Products

THE FANNER MANUFACTURING COMPANY
Division of Textron, Inc.
BROOKSIDE PARK • Established 1894 • CLEVELAND 9, OHIO
Telephone: SHadyside 1-6000 TWX: CV39

AGENTS and DISTRIBUTORS IN PRINCIPAL CITIES

ARMOR RODS · LINEGUARDS · TAP ARMOR · PATCH RODS · FANNGRIPS
PLASTIC FANNGUARDS · PLASTIC INSULATING TUBINGS AND MOLDINGS

of marketing in Casper will be used in determining whether the other S & L stores will enter the appliance market.

► **A kitchen promotion kit** aimed at getting more of its dealers into the kitchen business has been prepared by Hotpoint. Entitled *Kitchen Imagination*, it is available to consumers at 25c per copy. This booklet is being advertised in consumer magazines and Hotpoint dealers will be able to offer it free to their customers.

Products

Whirlpool has a new vacuum cleaner styled after the self-propelled cleaner in its Miracle Kitchen. It is 8 in. high, 13½ in. wide and 19 in. long, weighs 14½ lb. is claimed to be the lightest full-power home cleaner on the market.

An insert-type central home air conditioner said to install through the wall almost as easily and inexpensively as a room unit has been announced by Frigidaire. Production is scheduled for April.

Philco's new split-level built-in oven has two parts, a roasting oven and a baking drawer.

Klassen Enterprises, Hayward, Calif., has an automatic electric can opener, the Canoelectric, retailing at $29.95.

Tuttle & Kift has exclusive rights to a **surface cooking device** using electric magnetic eddy currents. Claimed advantages for the unit, developed in Germany, are reduction in cooking time up to 50%; greatly reduced heat loss into the kitchen. The unit itself does not get hot, the utensils on it do. While the unit is not yet in production, it is estimated that retail price initially would be around $400.

A fluorescent fixture for the home that has found surprising acceptance is the Area/Liter Sixteen produced for Graybar, which is distributing it, by Fluorescent Fixtures of California. It makes use of two Circline fluorescent lamps, one 32-w and one 40-w, in a 24-in. square fixture that can be placed against the ceiling or suspended on a hanger. With a plastic diffuser it has the same character of light distribution as other Area/Liters.

For the future — Westinghouse is showing an electric oven with a remote radio control that enables the homemaker to turn her oven on and off even though she is away from home. The tiny radio transmitter is carried with her. Also to come and being shown in model is an electronic surface unit.

Integrated ceilings were used to revitalize the interiors. Wm. G. Merchant, Architect; Smith and Garthorne, Consulting Electrical Engineers; Chas. B. Farrow, Inc., Electrical Contractor. All in San Francisco.

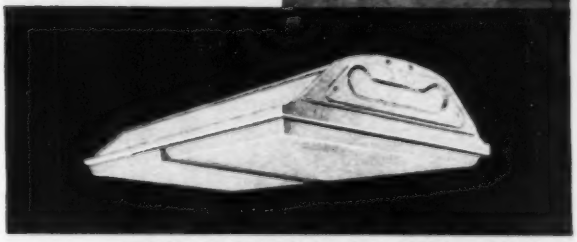
HOW TO MAKE NEW BUILDINGS FROM OLD...

Pacific Gas & Electric Company did it with integrated ceilings featuring 3700 ALL-BRITE MODU/LITERS

EASY!

Formula for a magic transformation: take an old building with high ceilings, suspend new ceilings on T-bar frames with all heat and air ducts **above**, rest All-Brite Modu/Liters on same T-bars, remodel below. Voila! — a new interior, bathed in 100 foot candles of evenly distributed fluorescent light. Wm. G. Merchant, with Smith and Garthorne, did it for P. G. & E. in San Francisco . . . you can do it, too! Ask us for the full story.

All-Brite
LIGHT OF THE WEST



All-Brite Modu/Liter is made in 2 x 4 foot modules, for 2, 3 or 4 rapid start lamps. Fixtures rest on T-bars supporting new ceiling. All ductwork is above.

FLUORESCENT FIXTURES OF CALIFORNIA

352 SHAW ROAD
SOUTH SAN FRANCISCO, CALIF.

PLANTS ALSO IN LOS ANGELES; PORTLAND, OREGON; AND VANCOUVER, B. C., CANADA

A new noiseless ultrasonic dishwashing machine will be available commercially, perhaps within the year, according to Robert L. Rod, president of Acoustica Associates Inc., which specializes in research and manufacture of ultrasonic equipment.

► Householders who wanted to know how to live better electrically got the right answers at the Seattle Home Show, March 1-9, sponsored by the *Post Intelligencer* and the Home Builders Assn. Local members of the Electrical Women's Round table helped staff electrical exhibitors' booths and acted as hostesses throughout the show.

About Sales People

► Important changes in the home service department of Portland General Electric Co. were announced early in February by C. W. Brissenden, general sales manager. Anne Ogden, who has been several years with the company, was made home service coordinator and Patty Post, formerly with Southern California Edison and recently a teacher in the Portland public schools system, was added to her staff. Grace Schoeni, for the past several years in the home service department, has been appointed home lighting adviser. In her new capacity, she will work with home builders and owners in the early planning and improvement of the illumination and decoration in the home.

Ann Ogden

► Tom Carmichael, Burns & Carmichael, Seattle, has been named convention committee chairman by NARDA's 1958 president, Joseph Fleischaker.

► William P. Frost has rejoined Westinghouse Appliance Sales as district sales manager of TV, hi-fi, room air conditioners and vacuum cleaners. His headquarters are at Vernon, Calif.

► Frank Wallace has been made sales manager for Home Laundering Equipment Co. in Los Angeles. The firm recently was appointed the ABC distributor for southern California.

► In Philco's new regional setup, H. Guy Hagerty Jr. will be responsible for distribution in the West Coast region from headquarters in Los Angeles.

R. V. Jones Wins Kwh Rodeo

R. V. Jones, division engineer of the Pacific Gas and Electric Co., won ELECTRICAL WEST's first annual Kilowatt-hour Derby with an estimate of 120,612,845,000 kwh as the kilowatt-hour output for the 11 Western states for the year 1957. Official Federal Power Commission figures for the year totaled 120,631,866,000 kwh. Thus Mr. Jones was more than 99.99% accurate in his estimate. Incidentally, the figures reveal that the electrical growth during the year in the 11 Western states was 6.27%.

Winner Jones will be presented with the $500 worth of Hawaiian Electric Co. stock (plus accrued dividends since it was purchased in June 1957) at a ceremony in Fresno on April 11.

The 12 closest figures on either side of the winning entry are as follows:

Below		Above	
Name	Figure	Name	Figure
R. A. Reid, superintendent, generation, Montana Power	120,610,400,000	Walker H. Lindsay, supervisor, rural sales, Sacramento MUD	120,651,343,342
Harold Z. Frank, senior valuation engineer, PG and E	120,596,000,000	Frank S. Ferry, assistant electrical engineer, Seattle City Light	120,652,343,242
J. E. Anderson, comptroller, Puget Sound P&L	120,595,593,000	Fred Garrison, manager, product sales, Appliance Division, General Electric, Los Angeles	120,667,000,000
D. F. Packard, senior electrical engineer, North American Aviation	120,590,400,000	Vivian M. Wheeler, customer service clerk, Arizona PS	120,675,022,589
George S. Hager, service man, Idaho Power	120,582,138,000	Jack D. Stevens, consulting engineer, Puget Sound Utilities Council	120,676,179,000
Glenn Ward-Davis, senior electrical engineer (distribution), Seattle City Light	120,566,792,000	M. Marshall Daggett, power consultant, Southern California Edison	120,695,373,454

Although missing out on the grand prize, the runners-up can take consolation in the fact that their crystal ball is apparently in excellent working order.

Only 6.4% of the contestants were in the 120,000,000,000-kwh bracket in the contest. Fully 75% of the contestants were higher than this figure and it was only the relatively slower electrical growth in the output during the last two months of the year that brought the annual increase below 7%.

Congratulations to the winner and good luck to all of the losers who have another chance to win a $500 block of stock in a Western utility in Electrical West's second annual Kilowatt-hour Rodeo, the empty blanks for which are on the opposite page.

Announcing

The 2nd Annual Load Forecasting Contest

West's Kilowatt-hour Load Forecasting Rodeo

A Chance To Put Your Brand on a $500 Block of Stock of a Western Utility

The Object — To forecast the total kilowatt-hour output of the power stations in the 11 Western states for the year 1958, giving reasons for the estimate in 25 words or less. Federal Power Commission figures of kilowatt-hour output will be the final authority.

The Contestants — Any person employed in any segment of the electrical industry in the 11 Western states, Hawaii or Alaska may submit one entry in the contest—using the attached postcard or a reasonable facsimile thereof. Entries must be postmarked not later than June 30, 1958. Employees of the McGraw-Hill company and its subsidiaries are ineligible to participate.

The Prize — ELECTRICAL WEST will award the winner, who comes closest to the actual official FPC kwh output figure, $500 worth of common stock in one of the electric companies serving an area of the 11 Western states. The electric utility whose common stock will be the prize will be determined by a drawing held at the annual Pacific Coast Electrical Assn. convention in Coronado, California, May 14-16, 1958. Stock representing the prize will be purchased immediately after the drawing and held in escrow with any accrued dividends until the winner has been determined. In case of ties, the prize will be divided equally between those submitting the winning figure.

A Hint — In 1957 the official kilowatt-hour output figure for the 11 Western states was 120,631,866,000 kwh as reported by FPC.

It's Fun — It's a game of skill — **and a test of your optimism about Western growth. Calculate what this figure will be for 1958! It costs nothing to enter the contest. Just send in your estimate on the attached card, by letter or other postcard.**

To ELECTRICAL WEST's Kilowatt-hour Contest Editor

Here's My Forecast

The annual kilowatt-hour output for the 11 Western states for the year 1958 will be ..... kwh.

Here's why (in 25 words or less). .....

.....

.....

.....

Name .....

Title or job .....

Company .....

Address .....

City ..... State .....

(Return before June 30, 1958)

Put Your Brand on $500 of Stock

Use this Card to Enter

ELECTRICAL WEST'S

—Kilowatt-Hour Rodeo—

See preceding page for full details

Postage Will Be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

Electrical West's Kilowatt-hour Rodeo
68 Post Street
San Francisco 4
California

Handles the Complete Range of Fault Currents!...

Heart of the versatile Faultmaster Fuse Cutout is the small bore, fibre-glass reinforced, single vented fuse tube. This minimum inner diameter fuse tube of maximum mechanical strength assures positive expulsion action necessary for the safe, sure, instantaneous arc interruption.

The Hubbard *Faultmaster* Fuse Cutout will handle faults over the entire operating range from minimum to maximum available fault current. There is no need to constantly check available fault current values at many different points as the system is expanded.

Silver plated contacts, long life contact springs, positive closure, transformer type terminals, sleet, animal and bird proofing are but a few of the many outstanding features of the *Faultmaster* that assure enduring service. Mechanical load break attachment can be furnished on order.

Your Hubbard Representative will be glad to supply you with full information. Call him today—or write for Bulletin 756.

HUBBARD
Faultmaster
FUSE CUTOUT

HUBBARD AND COMPANY • 6301 BUTLER ST., PITTSBURGH 1, PA.

CHICAGO 50, ILLINOIS • OAKLAND 8, CALIFORNIA • PLANO, TEXAS

With the Contractors

Line Constructors Move

Northwest Line Constructors Chapter of National Electrical Contractors Assn. and activities associated with the chapter have moved to a new headquarters of its own at 4004 S. W. Barbur Blvd., Portland 1, Ore., its president, R. C. Hughes, announced. The line constructors formerly shared offices with the Oregon-Columbia Chapter, NECA. Nature of the line construction contracting for utilities and public agencies was so different from that of "inside" electrical construction that the move was made, March 10.

New officers of the chapter, elected at the beginning of the year are: R. C. Hughes, Spokane, president; E. B. Sargent, Tyee Construction Co., Seattle, vice-president; Riley R. Stevens, Stevens Tree Surgery Co., Portland, treasurer; George B. Schetky, Western Electrical Construction Co., governor. Additional directors are Roy L. Sargent, Power Line Erectors Inc., Spokane, and C. D. Casey, Casey Electric Co., Seattle. Mrs. Marian Carney is secretary to the board. There is no chapter manager.

With the Line Constructors Chapter the line construction apprenticeship and training coordinator, Douglas Ellis, and the employees benefit board office was moved too. Pension benefit payments are made here for members of four Northwest line locals covered by the area agreement.

Robert Burns, Oregon-Columbia Chapter manager; H. A. Hagen, new NECA field representative; John Scheffer, Alaska

► H. A. Hagen was recently appointed field representative for District 6, NECA, with headquarters in Portland. He has been working under the supervision of Joe Bollinger whose territory originally included the District 6's states of Washington, Oregon and Alaska. Bollinger will now concentrate in the District 8 area comprising Colorado, Wyoming, Montana, Idaho and Utah, with headquarters in Salt Lake City. Bollinger also acts as manager for the Mountain States Line Constructors Chapter.

Tri-District Convention In Los Angeles

Not a conference but a convention is what Los Angeles Chapter, National Electrical Contractors Assn., is preparing for the three Western districts, 6, 8 and 9, when they gather at the Biltmore, Los Angeles, May 4-7, says Charles A. Wikle, general convention chairman. Entertainment features include a block of seats at the Los Angeles (formerly Brooklyn) Dodgers doubleheader baseball game with Philadelphia as well as an afternoon at Disneyland and a banquet and show at the Biltmore Bowl.

Business program details have not gone beyond the rough-in stage as yet but the three district vice-presidents, W. R. Grasle of District 6, Portland, W. P. Robbins, District 8, Salt Lake City, and J. D. O'Connor, District 9, Sacramento, were working on it. The NECA mechanized bookkeeping system is to be one of the major projects started and the new marketing program will also be emphasized. All other NECA activities will be reviewed.

The idea of making the tri-district meeting a convention, said Wikle, is that it will afford many contractors in the West an opportunity to attend at less expense than a big national convention and an attendance of 800 is being aimed for.

B. L. Slater of Folsom took over the presidency of Sacramento Valley NECA from E. T. French at the annual dinner

San Francisco Electrical Contractors Assn. returned to work all of its officers at the recent annual election. Pictured, left to right, are: Fred Wider, Electrical Maintenance & Service Co.; Ed Scott, Scott Electric, secretary; C. D. Lindstrom, Weidenthal-Gosliner Electric Works; Emil J. Weber, president; Roy Moser, treasurer; Warren Smith, Smith Electric; John DeGregorio; Earl Peak, Central Electric Co., vice-president; John F. Bauer, Fischbach & Moore; Edward O. Kleinhans, K Electric of California. William Kennedy, Kennedy Electric, was absent. Earl Peak resigned as chapter governor and William Langlais, C. A. Langlais Co., was named to succeed him. It is Emil Weber's fourth term as president and most directors have also served several times

SD Dead End Strain Clamp

New . . . Anderson Electric's aluminum SD Dead End Strain Clamp with two exclusive features: keeper pieces are captured to U-bolts for quicker installation . . . no need to cut cable for insertion . . . no need to remove clamp bolts, nuts or keepers. Exclusive nose extension permits more stable seating of clamp nose at cable entrance into hot line strain carriers. Makes for easier maintenance of strain insulator strings.

SD Clamps are available in a wide range of cable sizes—.20″ to 1.55″. They are sold **only** through approved insulator manufacturers.

ANDERSON ELECTRIC CORPORATION • Birmingham 1, Alabama

Export Representative: International Standard Electric Corp.
50 Church Street, New York 7, N. Y.

ANDERSON ELECTRIC

Research/ Quality/ Performance/ in Aluminum and Bronze Products

Aluminum and Bronze Power Connectors • Clamps • Fittings • Accessories for SUBSTATION • TRANSMISSION • DISTRIBUTION

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- Hughes Aircraft Co. (Products Division)
- United States Rubber Co. (Uskon Division)
- Lapp Insulator Co., Inc.
- Arizona Gear & Mfg. Co.
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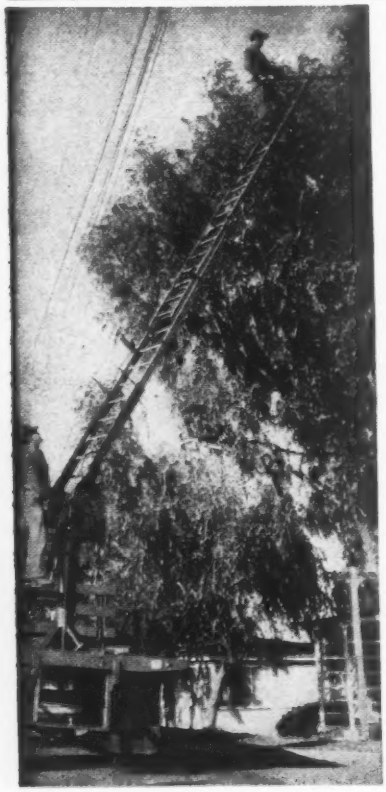


SURGICAL LINE CLEARANCE BY DAVEY

Davey is doing line clearing for 12 Public Utilities on the Pacific Coast —most of them served continuously for over 20 years. Davey specialized equipment and efficient methods save money . . . Davey surgical pruning benefits trees—builds goodwill.

DAVEY LINE CLEARING
DIVISION OF
DAVEY TREE SURGERY CO., LTD. OF CALIFORNIA
Russ Bldg., San Francisco, SUtter 1-3377
Story Bldg., Los Angeles, TUcker 1929

Manufacturers—Distributors

Expands in West

Sylvania Electric Products Inc. has purchased 26 acres of land in Santa Cruz, Calif., for future expansion of its computer component manufacturing operations. Gordon McClure, manager of the present operation employing 25 people, said the company has no immediate plans for construction. Size of the operation and number of employees needed are still to be determined.

Sylvania last month let contracts and started construction of a 51,000-sq-ft laboratory and administration headquarters building at its Mountain View, Calif., site. Cost of the project is $445,000.

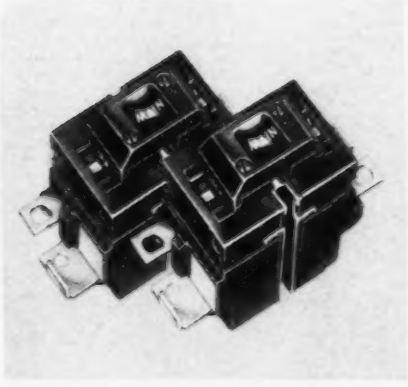
► **Western Switchboard Co.** of San Francisco, division of C. A. Langlais Co., is reorganizing and has announced personnel changes. According to Charles A. Langlais, president and chairman of the board, Roscoe R. Crooke will be vice-chairman of the board; William A. Langlais, assistant to the president; Miss M. Windall, secretary-treasurer; Charles E. Barkis, general manager; Joseph H. Landells, sales manager; Gustave I. Olivier Jr., works manager; William R. Blake, chief engineer.

► **Merger** of **Armco Steel Corp.** and **National Supply Co.** will be proposed to stockholders of both companies in April. The plan provides for transfer of National Supply's assets to a new subsidiary, which will be conducted with substantially the same personnel as the present company. Its stockholders would receive 85/100ths of Armco stock for each share of National.

► **Official symbol** has been provided for air moving products qualified by **AMCA certified ratings.** Its use is licensed by the Air Moving & Conditioning Assn. to manufacturers who pass qualifications having to do with testing and rating performance in approved laboratories; performing tests according to AMCA's standard; agreeing to maintain manufacturing control so that equipment will perform according to published ratings.

► An electronic **Magic Brain** is being used to compute the coefficients of utilization of fluorescent fixtures for **Lighting Dynamics** (formerly Ruby Lighting and now a

Pushmatic*– *welcome combination of safety and convenience*



BULLDOG DUO-GUARD PUSHMATICS are available in single-pole or 2-pole common-trip . . . come in 15, 20, 30, 40, or 50-ampere ratings. 70- or 100-amp 2-pole common-trip Pushmatics are available as factory installed units.

Pushmatic breakers give the over-all circuit protection your clients want. Available in 15- to 50-ampere ratings, Duo-Guard® Pushmatics fit any BullDog Electri-Center® panel . . . safeguard branch circuits two ways. Thermal-bimetal action protects against normal overloads. Magnetic action protects against high overloads and short circuits. When a circuit is open, just a push of the breaker restores service.

Compact Electric-Centers supply needs from 2 to 42 circuits . . . meet most industrial, commercial, institutional and residential needs. Pushmatic Electri-Centers are readily available, easy to install. Check your electrical contractor or BullDog field engineer for complete details, or write BullDog Electric Products Co., Detroit 32, Mich.

© BEPCO

BULLDOG

BullDog Electric Products Company, Division of I-T-E Circuit Breaker Company, Detroit 32, Mich. *BullDog Export Division:* 13 East 40th St., New York 16, N.Y. *In Canada:* BullDog Electric Products Co. (Canada) Ltd., 80 Clayson Rd., Toronto 15, Ont.

*Circuit breaker trademark registered by BullDog Electric Products Co.

CONSULT THE FOLLOWING PACIFIC COAST REPRESENTATIVES:

COAST ELECTRIC & MANUFACTURING CO.
1733 N.E. Seventh Avenue, P.O. Box 7712
Portland 12, Oregon

YOUNG ELECTRIC & MFG. CO.
2134 Curtis St.
Denver 2, Colorado

SAFETY SWITCHBOARD COMPANY
910—89th Avenue
Oakland 21, California

BULLDOG ELEC. PROD. CO. OF LOS ANGELES
2885 E. Washington Blvd.
Los Angeles 23, California

John Doyle, vice-president in charge of sales for Murray Mfg. Corp., pictured with Western representatives at the company's 1958 sales convention in New York, which introduced the new MP breaker. From left: Ralph Mooney, Phoenix; Doyle; Ernst Hauch, San Francisco; Joe Woltring and Harry Weinstein, Portland

subsidiary of Ekco products). The results are accurate to five decimal places, hitherto unobtainable, and will be used in the company's new catalog to be released in the early spring. Copies may be reserved by writing to Lighting Dynamics Inc., 802 W. Whittier Blvd., Whittier, Calif.

► **Soapstone Duct** Co. of Oakland, Calif., has installed a new oven, 100 ft long and weighing 25 tons, largest of its kind in the area. Known as an autoclave, the new installation will be used in production of underground conduits, according to Frank and Robert Chambers, owners of Soapstone. Built in Berkeley, the huge tank took two railroad cars and had to be delivered over a carefully planned route to avoid disrupting traffic or damaging streets.

► **Halline Equipment** Co. of Portland has outgrown its Swan Island quarters and will build a 20,000-sq-ft plant at 5525 S. E. 28th Ave. Founded by Thomas R. Hall and his father in 1952 as the American Truck Equipment Co., the firm makes a line of heavy-duty utility pole diggers, derrick and ladders in Portland and truck bodies in an Oakland, Calif., branch.

► **McMillen & Stanley Sales** Corp. and the **J. C. Epperson** Co. have combined as manufacturers' representatives. The lines handled by Epperson, Miller, Stonco, Amplex, Kirlin, Nu-Art and Honeylite, have been added to those handled by McMillen & Stanley, Touchplate, Stephens Mfg. Co. and Victor Equipment. Robert Coleman and Charles Maines represent these lines in the field. Alan Wood is office manager at 721 Bryant St., San Francisco.

► **Central Electric Supply** Co. of Denver has added the complete line of Lithonia Lighting Co. of Conyers, Ga. Ira Beck, central vice-president, said his firm is warehousing all lighting fixtures and supplies manufactured by the Georgia firm to serve electrical contractors and others direct.

► **Tracy-Behrent Engineering** Co. continues to outgrow its quarters at Denver. Only a year ago the firm, specializing in electrical engineering, moved to new facilities in suburban Lakewood. Now the partners, John Tracy and Robert Behrent, have announced they are building a 1,000-sq-ft addition to provide enlarged drafting room facilities.

► **California Wholesale Electric** Co. in Los Angeles is now handling Panduit plastic wiring channel for control switchboards in southern California. The channel permits wire to be laid in slotted grooves, eliminating the need for harness wiring.

► Expanded facilities have been opened in Denver at 70 Galapago St. by **Kennedy Electric** Co., a contracting and maintenance firm. Roy P. Kennedy, president, said the enlarged operations by his firm will be limited to the Denver area.

► **Peterson Sales** Co. of Denver has added Daystrom Transicoil to the lines of electrical products it markets in Colorado, Wyoming and Utah.

Annual Reports

Net earnings of **General Electric** Co. in 1957 were 16% above 1956; net sales were up 6% as compared with the 1956 record and 25% above 1955. Net earnings in 1957 totalled $247,851,871, $2.84 a share; net sales billed amounted to $4,335,664,061.

Consolidated net sales of **Federal Pacific Electric Co.** for the six months ending Dec. 31, 1957, were $26,932,654 and net profit after taxes, $1,388,460.

Whirlpool Corp. reported 1957 sales up about 10% and slightly in excess of $400,000,000.

A new record high in sales was reported by **Sylvania** for 1957. Net sales of $342,957,061 represented a 7% increase in commercial business and a 9% decrease in defense billings, due principally to completion of certain production contracts. Last year's earnings were below the previous year, attributed to increased research and development expense, higher manufacturing costs from changeovers to new product designs and intensive price competition.

Philco's 1957 sales amounted to $372,629,000, a 5% increase over 1956. Consolidated net income rose to $4,363,000 compared with $567,000 in 1956.

► **Aluminum Co. of America** has established a sales office at 325 Grove St., Boise. Robert W. Roylance, formerly of Alcoa's Portland sales office, was named resident representative. The Boise office will function under H. A. Faisst, manager of the Seattle district sales office.

J. D. Cockrell, right, chief electrical plant engineer, city of Tacoma, accepts the TV he won for taking second place in Pennsylvania Transformer Division's nationwide contest built around its Pole Star unit. F. W. Carlson, Pennsylvania Transformer's Seattle representative, makes award

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The fibrous structure of wrought iron confines corrosion to the surface of the conduit . . . makes wrought iron superior to any other conduit for extreme corrosive areas.

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The National Electric Sherardizing process of galvanizing actually alloys zinc dust with the wrought iron conduit. This uniform zinc-wrought iron alloy protection is permanently bonded to the walls. NE Wrought Iron Conduit is Sherardized *after* the threads are cut to assure complete end-to-end protection for the base metal.

3. Interior and Exterior Protection with New Formula MVC-1

National Electric coats its wrought iron Sherardized conduit with an exclusive new acid-resistant vinyl enamel —MVC-1, a Modified Vinyl Copolymer. MVC-1 will not flake or chip when bent and is extremely resistant to high temperatures. Inside the conduit it provides a smooth finish for fast, easy fishing of conductors.

*National Electric Wrought Iron Conduit is processed from wrought iron pipe manufactured by A. M. Byers Company, Pittsburgh, Pennsylvania. A. M. Byers is the world's largest producer of wrought iron and the only manufacturer of wrought iron pipe. Where corrosion is a serious and costly factor, wrought iron has proved to have superior durability over other ferrous metals.

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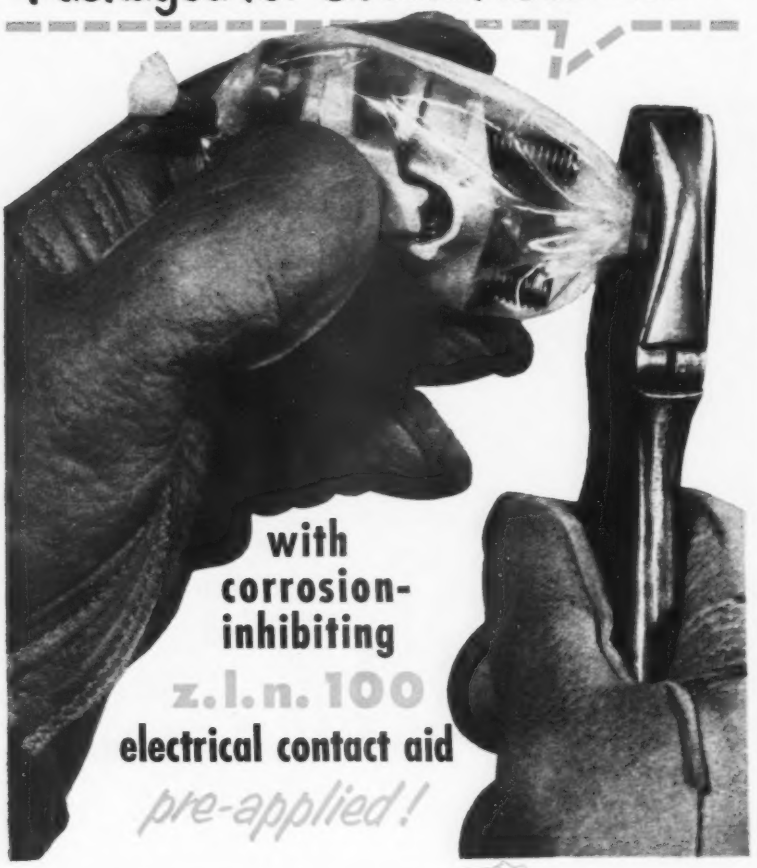

All Chance Uniclamps -Parallel Groove Clamps -U-Bolt Connectors -and Hot Tap Clamps are now available in individual plastic packages with z.l.n.100 pre-applied! Clamp stays clean . . . sealing tape reminds lineman to wire-brush and apply z.l.n.100 to the conductor too!

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CC58-9

People

WWP Changes

The retirement of Earl Baughn as chief transmission and distribution engineer for Washington Water Power Co. has resulted in extensive changes in the engineering department organization.

Baughn's former title is being abandoned. Instead, Ralph Guse, as transmission engineer, will be responsible for the electrical and mechanical design and specific location of transmission lines, while E. G. Peters, as distribution engineer, will be responsible for the planning, design and location of distribution lines in the Spokane division. Jack Wright, as distribution engineer, will parallel Peters' job for the outside division.

All are under the supervision of Clarence Cannon, chief electrical engineer.

► **I. M. White** has been appointed vice-president and general manager of the Pelton Division of Baldwin-Lima-Hamilton Corp. in San Francisco. He succeeds W. F. Boyle, who has been appointed vice-president and general manager of the B-L-H Hamilton Division, Hamilton, Ohio.

White

► **E. E. Fox** has been placed in charge of public information in the coast metropolitan area of British Columbia Electric Co. **Neil A. McKelvie** returns to the company to be supervisor of the editorial section publishing all of the company's publications. **Mildred Jeffery,** who has been secretary to the public information manager, has been named press assistant in the editorial section.

► **Wayne L. Brassey,** representing Harvey Hubbell Inc. in the East Bay and also in Nevada, has gone to Bridgeport, Conn., to become special assistant to the sales manager of the company. He is succeeded in San Francisco by **Robert Flynn,** working under Grover Anderson in the branch office.

► **Carl Geis** is now outside salesman for State Electric Supply Co., Oakland, following the departure of

No. 4 in a series

Right off the Wire

Power for earth satellites could be supplied by a new chemical battery that uses a dye to convert sunlight into electricity.

A new bearing metal of tin and aluminum is said to combine the bearing qualities of one with the light weight of the other.

Negatively ionized air is being used as a painkiller for patients with severe burns. After two exposures of twenty minutes each no narcotics are needed.

Users of High Voltage cables should note that high molecular weight polyethylene can be expected to have a voltage life about seven times that of standard polyethylene. (From paper on Dielectric Strength and Voltage Life of Polyethylene, presented at AIEE Winter General Meeting, February 1958, by Messrs. Hunt, Ware and Koulopoulos of Simplex.)

A new, automatic door opener is installed overhead, like a door check, and requires no complex, under-floor wiring. It can be installed in a few hours.

In a new cook stove the heat is generated in the utensil by putting it in a magnetic field. No heat is wasted and spilled food does not burn. It is said to be faster than ordinary electric stoves.

The "cage zone" melting system has proved successful in purifying niobium. Under high vacuum the metal is melted by high frequency current and the impurities separate to be cut off later.

A vinyl lining material for swimming pools of masonry or wood is in the form of sheeting with an adhesive back that sticks to the sides and assures complete waterproofing.

To meet the growing demand for power by industry, Simplex has installed new equipment that allows cable cores of greatly increased diameters to be armored with CONDEX, the interlocking armor tape made by Simplex since 1924.

Printed pages can actually be made to talk by means of a Japanese invention. The back of the paper is treated like magnetic tape and produces recorded sounds when a reproducing head is passed over the printed words.

Further information on these news items and on Simplex cable is available from any Simplex office. Please be specific in your requests.

A new, thirty-nine-passenger bus for intercity service is claimed to have many advantages. It has a flat floor (no step-up to seats), a "recreation area," lavatory, reclining seats and air suspension.

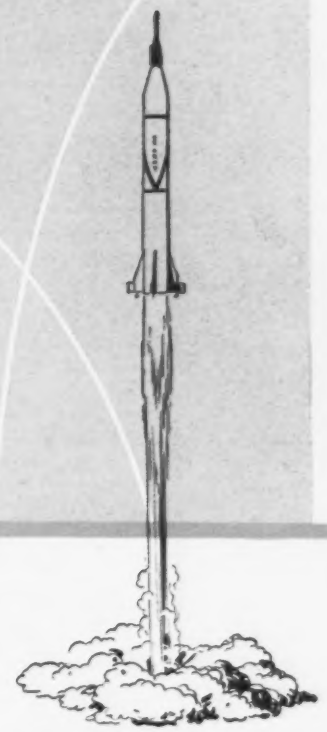
The size of electrical components may be further reduced by a process for putting tiny germanium transistors into printed circuits.

Buildings are being erected with the use of balloons instead of derricks.

A method of projecting color pictures on a screen from black and white slides has been discovered.

An acknowledged leader of the cable industry in research and manufacturing skills, Simplex scientists and engineers present technical papers on a variety of subjects of interest to users of insulated cables. A list of papers read before the AIEE and other associations will be sent on request.

"the American manufacturers of transoceanic telephone cables"



Underwater nerves take the "miss" out of missiles

Test rockets fired from the U. S. Air Force Test Range in the Bahama Islands are tracked electronically from a series of check points along their routes. This close observation detects the slightest variance from the missiles' intended flight path. The vital communications link for this work is a 1400-mile Simplex submarine cable to Puerto Rico — a product of the world's most modern techniques in under-water cable manufacture.

For high voltage power transmission or the most exacting communications cables, Simplex' research, engineering and manufacturing facilities are at your service.

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Robert Flynn, who joined Harvey Hubbell Inc. **Harry Butler,** State Electric purchasing agent, becomes sales manager and purchasing agent, and **George Geis** becomes an outside salesman.

► **Harold M. Cantrell** has been appointed district manager of the Bonneville Power Administration at Kalispell. He has been serving as interim manager since the transfer of C. E. Cartwright in January.

Alcoa Promotions

W. E. "Bob" Lawton, chief electrical engineer at Alcoa's Vancouver operation, has been appointed the company's Northwest power manager. He succeeds Waldo Porter, who moves to the smelting division in Alcoa's Pittsburgh headquarters as production assistant on power matters. Lawton will continue as chief electrical engineer of the Vancouver works in addition to his new responsibilities. Porter, a 22-year Alcoa veteran, is a member of two AIEE national committees—the industrial power rectifier committee and the electrochemical processes committee.

Lawton

Porter

► **James Land Jr.** has been named sales manager of the northern California division of Zinsco Electrical Products. He will headquarter at 1841 Adeline St., Oakland.

► Arthur S. Dempsie, manager of the Clatsop district of Pacific Power & Light Co., retired March 1. He had been with the company for 39 years, and headed up the district since 1929. Dempsie is succeeded by **Edward A. Britts,** formerly manager of the company's Rainier district. **Albert C. Bustrin** of the Rainier district has been promoted to the managership there.

► **Harry W. Hall,** 87, chief electrical engineer on the General Electric Co. staff, which designed and built the first hydroelectric project in northern California, died in Arcadia, Calif., recently.

► **Leonard W. Towner** retired March 1 after more than 29 years of service with General Electric Co. He was lighting specialist in the company's Pacific southwest district in Los Angeles at the time of his retirement.

► **Allen C. Conger** has been appointed Northwest regional manager in charge of Brown Boveri Corp.'s new office in Portland. He is responsible for all operations in Oregon, Washington, Montana, Idaho and Alaska. Brown Boveri occupies Suite 701, Executive Building, 811 S. W. 6th Ave., Portland. Conger is a member of AIEE and the American Society of Mechanical Engineers.

Conger

► **William D. Eminger** has been appointed superintendent of generation of the Montana Power Co. He succeeds Ricklef A. Reid, who retired Feb. 1.

► **Donald E. Hughes** has been appointed chief engineer of Cowlitz County PUD to succeed **R. J. Pangborn. Kenneth J. Lien** has been named assistant chief engineer, assuming the position formerly held by Hughes.

► **Richard G. Broom** has been assigned as sales representative to the Allis-Chalmers Denver district office.

► **Thomas W. Dwyer** has been appointed assistant sales manager of Swan Mfg. Co. in Oregon and Washington. The company manufactures Vecto-ray baseboard heaters.

► **Steve C. Mulle** has been appointed manager of market planning for the Pacific Coast region of Westinghouse Electric Corp. He replaces Robert W. McLean, who has been transferred to a sales assignment.

► **Bert N. Hardy** has been appointed chief electrical inspector of Tacoma City Light. He has had 12 years with the utility. He succeeds **William L. Gaffney,** who retired Dec. 31 after 33 years in the department.

► **Robert A. Else** has been appointed district manager, Seattle district, of General Electric's assemblies and components sales organization.

Montana Power Changes

Harold K. Near, manager of the Bozeman division of Montana Power Co., retired Feb. 1. He will be succeeded by W. W. Talbott, former Lewistown division manager. Kennan W. Skeen becomes manager at Lewistown.

Herold E. Murdock takes over as division superintendent, and Louis G. Brewer succeeds Murdock at Great Falls.

David C. Johns is promoted to division superintendent at Missoula to succeed Brewer. Walter G. Kelley becomes assistant division superintendent at Great Falls.

C. L. Covington has been named engineer in charge of electric operations at Livingston, and Donald M. Leuschen becomes assistant division superintendent in Bozeman.

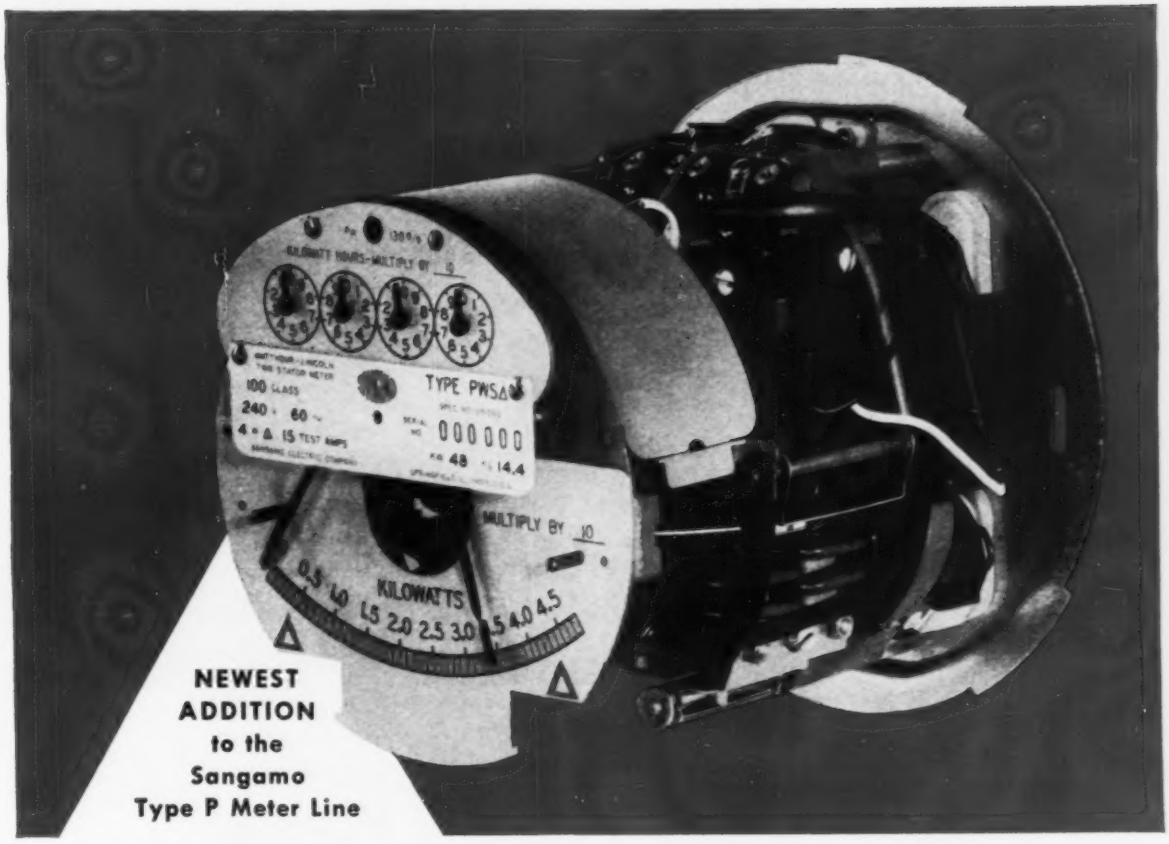
Richard Davenport, Lewiston division superintendent, transfers to the general office engineering department in Butte, and Andrew C. Robinson will succeed Davenport at Lewistown.

► **Charles E. Shevling** has retired as project engineer for Seattle City Light. He has been with City Light for 33 years. Shevling will assume a position as project engineer on the Yanhee multipurpose project in Thailand.

► **Andrew C. Perrin** has been promoted from district sales manager of the San Francisco-Pacific Northwest district of Reliance Electric & Engineering Co. to Western regional sales manager. He will continue to headquarter at the company's distribution center in Burlingame, Calif. **Howard A. Latta,** Reliance manager in Los Angeles since 1945, becomes district manager in Pittsburgh. New manager at Los Angeles is **Walter A. Jensen.** He has been a sales engineer in the San Francisco district for the past four years.

Perrin

► **Rene B. Marxheimer** has been appointed laboratory engineer for design development and research at Globe Lighting Products Inc., Los Angeles. He was formerly with the California State Department of Public Works as electrical engineer in the Division of Highways and was active in the lighting design for the Richmond-San Rafael Bridge.



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NOW . . . for convenient, dependable demand measurement of all polyphase circuits . . . Sangamo presents the Type PWSΔ combination watthour/thermal-demand meter.

ALL NEW DESIGN combines the features of Sangamo's new two-stator four-wire delta meter with the time-proven Lincoln watt demand meter. Both the watthour meter and the demand meter are complete units that function independently on entirely separate circuits.

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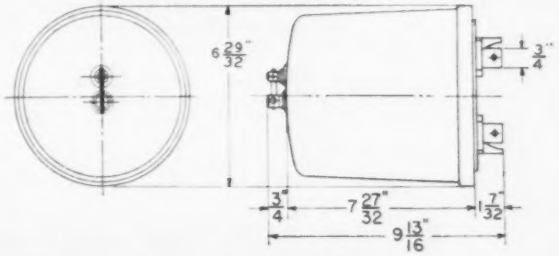
The Type PWSΔ is a compact assembly that is mounted on a standard circular base plate, and is enclosed by a conventional round glass cover. The PWSΔ is built like—and looks like—the popular Sangamo Type J2TS.

EASY TO READ—EASY TO ADJUST. Kilowatthour dials are never obstructed by the demand pointers. Simple and readily accessible adjustments are provided for both demand and watthour meters.

EASY TO MAINTAIN. All Lincoln secondary leads are solder-connected at convenient junction blocks. Register assembly can be removed without disturbing soldered connections for easy access to watthour meter components. Watthour meter—including bearing system—is *guaranteed for life.*



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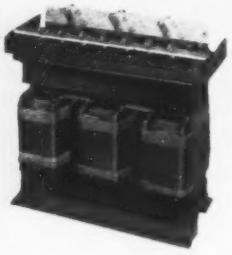

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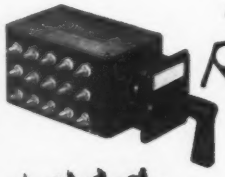

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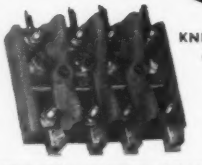

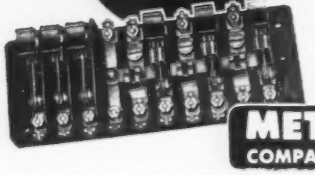

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BUYER'S GUIDE AND DIRECTORY

1958 Edition sent to all subscribers in November. Extra copies available $1.00 each. Write to Circulation Mgr., Electrical West, 68 Post St., San Francisco 4, Calif.

New Departments

Pacific Power & Light Co. has announced the formation of a new division in the engineering department, and assignment of new responsibilities for three executives under E. Robert de Luccia, vice-president and chief engineer. Albert Bauer, assistant chief engineer, becomes manager of construction and operations that are not handled in the company's districts.

Bauer

Bauer has been with PP&L since 1955. George L. Beard, assistant vice-president, who has had charge of project investigations and developments, becomes assistant chief engineer and manager of engineering. A PP&L official since 1954, Beard will be responsible for all of the company's engineering, and also will continue to direct special projects.

Beard

Lisbakken

The new engineering division will take over the load and power resource forecasting, preparation and evaluation of utility and government power purchase contracts, and direction of the department's utilization of PP&L's electronic computer. This division will be headed by Robert B. Lisbakken, who also was named an assistant chief engineer. He has been with Pacific Power since 1946.

► **Ernest R. Anderson,** consulting engineer for the Telluride Power Co., announced his retirement after 52 years in the electrical industry. He is a past president of the Utah Chapter, International Association of Electrical Inspectors.

► **Duane A. Little,** a graduate electrical engineer, has been appointed fixture sales engineer, and **Lee Thompson** was appointed a special representative in sales for Sylvania Lighting Products in Denver.

► **Chester Moses Jr.** has been named vice-president in charge of the Western and Pacific Coast divisions of Thomas & Betts Co. His appointment was one of four made by the company in preparation for a program of product line expansions this year. Headquarters for Moses are in Chicago.

Moses

► **Jack Rollins** has been appointed director of public relations for the Los Angeles-Southern California Chapter of the National Electrical Contractors Assn. **Pat Nagel** has been named assistant chapter manager.

► **Henry F. Hopkins,** for the past seven years senior electrical estimator for the State of California, has joined Electrical Estimators in Los Angeles as vice-president.

► **Walt Jensen** has been promoted to Los Angeles branch manager for Reliance Electric & Engineering. He transfers from the San Francisco office to succeed **Howard Latta,** who moves to Pittsburgh, Pa.

► **David A. Pease,** former editor of the Camas, Wash., *Post-Record,* has been named research editor for the Northwest Public Power Assn., Vancouver.

► **Arnold L. Henny** has been named chief of the relocations section of the engineering division of Portland District, Corps of Engineers. Henny, who has been chief of the Portland District "308" review report section, succeeds **Glenn K. McKenzie,** recently retired.

► **John Walsh** has been appointed to the new position of manager of area development for Pacific Gas and Electric Co. He will be succeeded as director of commercial sales by **Stan Blois.** Two other appointments resulting from the change involve **R. L. Sawyier,** who becomes chief illuminating engineer, and **G. N. Radford,** who is now field supervisor, commercial lighting, East Bay division.

► **Robert W. Stinson** has been appointed overhead system general supervisor for Seattle City Light. He succeeds Gerald J. Dermody who retired recently.

These supplementary pages, just off the press, contain blueprints and complete specifications on revisions and additions to our line of Drop-Forged Steel and Aluminum Hi-Line Hardware.

Bring your BTC Hi-Line Hardware Catalog up to date . . . send for these FREE supplements today. If you do not have a catalog, indicate this on coupon and a complete, revised copy will be mailed to you without charge.

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Association Affairs

Programs Announced for Three IES Regionals

A glimpse of light from behind the Iron Curtain, what phenomenal foot-candle levels people need, higher output light sources, new plastics and a chance to catch up on the lighting industry's progress in a fast moving year will be given those who attend any of the three regional conferences of Illuminating Engineering Society in the West in May. The Intermountain comes first, at Hotel Whitman, Pueblo, May 8-9. South Pacific Coast region just precedes the PCEA convention at Coronado by holding its conference May 12-13 at El Cortez Hotel in San Diego. The Pacific Northwest will be held at the Multnomah, Portland, May 22-24.

While final details of the programs are not yet completed each will be favored by a participation from dynamic tennis champion Kirk M. Reid, IES president, General Electric Lamp Division, Cleveland, and C. L. Crouch, IES technical director, and several national leaders in the lighting field. Crouch will bring the surprising results from Dr. Blackwell's research on lighting levels needed for various seeing tasks.

W. P. Lowell Jr. and his wife, Sylvania Electric Products, will bring their observations of "Light and Life Behind the Iron Curtain," W. H. Kahler, Westinghouse Electric Corp., Cleveland, will discuss "Plastics in Lighting." Willard C. Brown, General Electric Lamp Division, Cleveland, will show "Applications of Very High Output Lamps."

Each of the three conferences will have its runoff of the winners of chapter and section "My Most Interesting Lighting Job" contests.

Air Force Academy—Intermountain

Special feature of the Intermountain conference will be a guided tour of the new U. S. Air Force Academy at nearby Colorado Springs, with a panel of engineers telling of its lighting features. In addition to the national speakers there will be a panel on ballasts, and a talk on "Lighting and Vision" by Dr. Al Sutton, Pueblo Optometrist. E. H. Pemberton, Southern Colorado Power Co., is general conference chairman, Carl F. Balsick program, Charles D. Bell registration, Robert F. Even finance, Jack Bruno publicity, Ronnie Rowe transportation, Kenneth J. Stines MMILJ contest, Joe Edwards and Mary Douglass ladies committee. Regional Vice-president A. E. Fleming, Director J. D. Whitnell, Lester Johnson and William Stultz are the executive committee.

Tijuana Lights—South Pacific

Beside the glass-enclosed outdoor elevator to the sky lounge and a Sunday evening preconvention tour of the bright lights of Tijuana, the South Pacific Coast conference will have as added program numbers: "Integrated Ceilings for Illumination" by J. S. Hamel, engineer, Burbank; the IES Lighting Progress Report by James H. McCulloch, Independent Testing Laboratories, Boulder; "Traffic Safety Lighting" by R. W. Matthews, California Division of Highways; "Function of Visibility Laboratory at University of California Institution of Oceanography" by Seibert Q. Duntley; "Don't Make Light of Dark" by W. A. Cyr, ELECTRICAL WEST; and a "Light for Living" residential session, with Jerre C. Blair, G-E Lamp, as moderator.

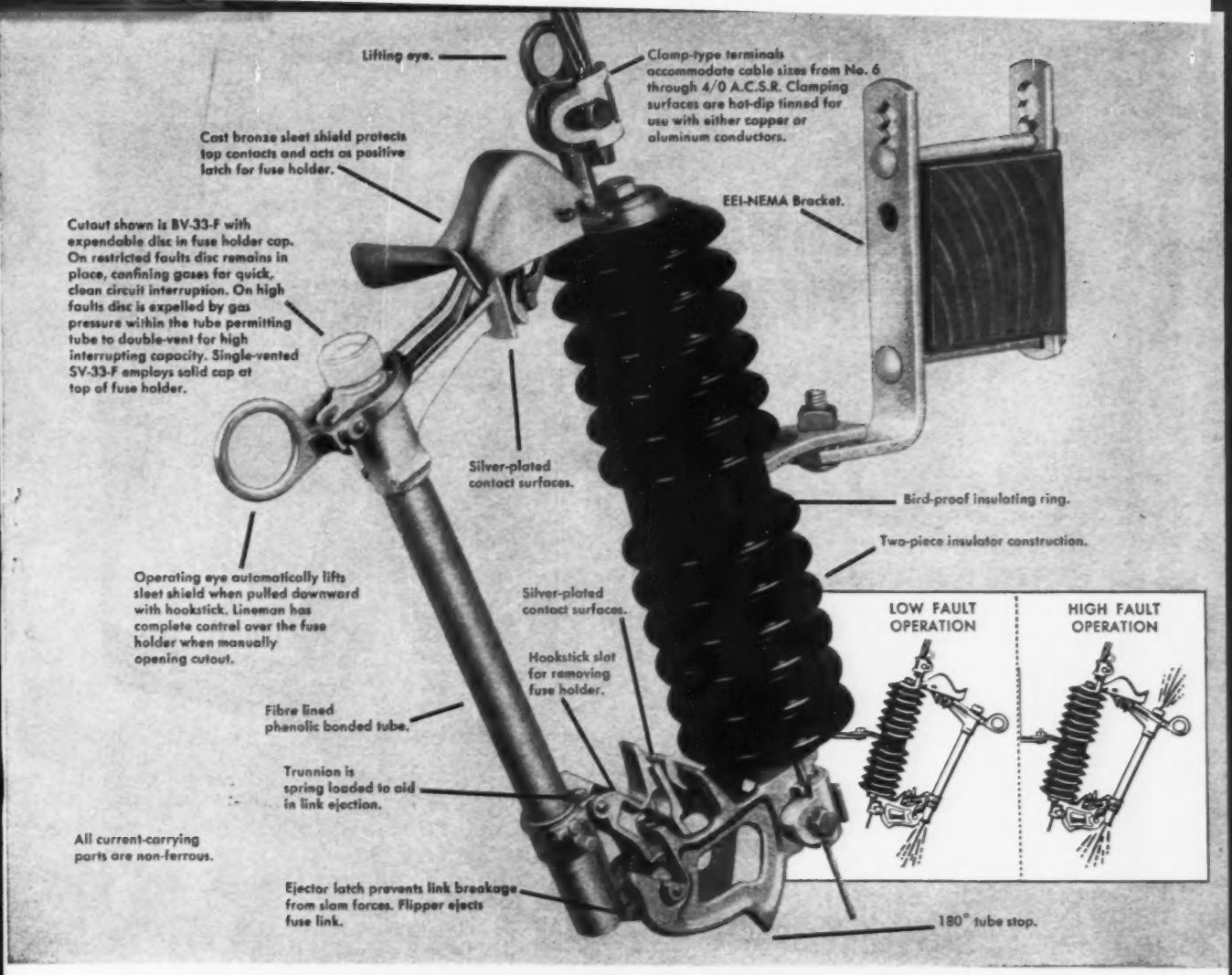
J. Walter Howard, G-E Lamp Division, is general chairman and Carlton M. Thompson, San Diego Gas & Electric Co., regional vice-chairman, is also program chairman.

Northwest Planning Meeting

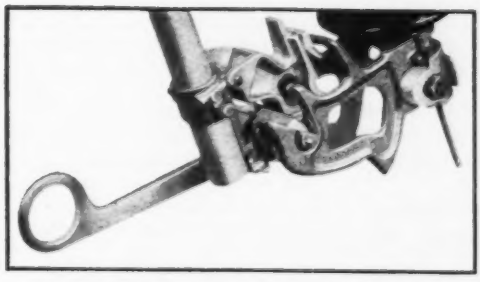
For the Pacific Northwest regional conference its general chairman, Walter F. Potter, General Electric Lamp, Portland, had not yet announced the program although most of the aforementioned national speakers are expected to be on the schedule. Kenneth Reid, city of Victoria, regional vice-president, was holding a meeting of the conference committee in March to complete final details.

► George C. Lipsey, former vice-president of the Britannia Mining & Smelting Co. Ltd., has been elected president of the Association of Professional Engineers of British Columbia.

► **Electrical Contractors Assn.** of Edmonton elected J. M. Connauton of Johnson Bros. Electric Ltd. as its president, succeeding J. M. McBride of Industrial Power Installations Ltd.


Lifting eye.
Clamp-type terminals accommodate cable sizes from No. 6 through 4/0 A.C.S.R. Clamping surfaces are hot-dip tinned for use with either copper or aluminum conductors.
Cast bronze sleet shield protects top contacts and acts as positive latch for fuse holder.
EEI-NEMA Bracket.
Cutout shown is BV-33-F with expendable disc in fuse holder cap. On restricted faults disc remains in place, confining gases for quick, clean circuit interruption. On high faults disc is expelled by gas pressure within the tube permitting tube to double-vent for high interrupting capacity. Single-vented SV-33-F employs solid cap at top of fuse holder.
Silver-plated contact surfaces.
Bird-proof insulating ring.
Two-piece insulator construction.
Operating eye automatically lifts sleet shield when pulled downward with hookstick. Lineman has complete control over the fuse holder when manually opening cutout.
Silver-plated contact surfaces.
Hookstick slot for removing fuse holder.
Fibre lined phenolic bonded tube.
Trunnion is spring loaded to aid in link ejection.
All current-carrying parts are non-ferrous.
Ejector latch prevents link breakage from slam forces. Flipper ejects fuse link.
180° tube stop.
LOW FAULT OPERATION
HIGH FAULT OPERATION

Southern States new cutout offers double action for double protection



THE LBV-33-F LOAD BREAK CUTOUT

Has all the features of the BV-33-F, including the expendable disc. It is equipped with a load break mechanism which permits it to serve as a load break switch. It is designed for use with universal button head links only in ratings as high as 100 amperes.

Type BV-33-F—5.2, 7.8, 15, 25 kv—100, 200 amps

THE POWERFUL NEW BV-33-F CUTOUT automatically provides protection against restricted as well as heavy faults.

An expendable disc in the fuse holder cap does the trick! On low faults it remains intact, restricting gases within the tube for maximum arc-quenching ability. On high faults the disc blows out, permitting the cutout to double-vent for maximum interrupting capacity.

Compare the features of the BV-33-F with any other cutout. Add to them the double protection it offers, and you have the answer to your cutout requirements.

For complete details, see your local Southern States representative, or write direct for Bulletin 570-C.

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PAC-5
ACSR 6—1/0 Cu. 8—1/0

PAC-3
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PAC-4
(formerly PAC 6—0)
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PAC-7 (replaces PARC 6—0)
ACSR 1 0—336.4
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Our exclusive method (Patent applied for) of pressure casting molten corrosion resistant aluminum alloy around specially treated pronged copper liners establishes an intimate, low resistance contact of the two metals without using corrosive solder.

The copper liners, which cannot be mated incorrectly, surround the copper conductor establishing a good copper to copper contact.

The aluminum grooves surround the aluminum conductors, establishing a good aluminum contact.

Adequate contact surface and conductor separation is built into Blackburn's PAC clamps to insure long-lasting, trouble-free copper to aluminum connections without setting up cold flow or galvanic corrosion.

Spring action is inherent in the design of PAC clamps and is supplemented with an extra-heavy spring lockwasher insuring permanently tight connections which will withstand temperature fluctuations.

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